PB83-144162

Analysis of In-Use Fuel Economy Data: Stage I

(U.S.) Environmental Protection Agency
Ann Arbor, MI

Aug 82

U.S. Department of Commerce
National Technical Information Service
NTIS

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
EPA/AA/CTAB/FE-82-6

2.

3. RECIPIENT'S ACCESSION NO.
PB83 144162

4. TITLE AND SUBTITLE
Analysis of In-Use Fuel Economy Data: Stage I

5. REPORT DATE
August 1982

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
U.S. Environmental Protection Agency
Office of Mobile Source Air Pollution Control
Control Technology Assessment & Characterization Branch
Ann Arbor, MI 48105

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
Same as box 9

13. TYPE OF REPORT AND PERIOD COVERED
Technical

14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report summarizes the need for, and the background work done on, adjusting the Environmental Protection Agency (EPA) miles per gallon (MPG) values to more closely correspond to actual fuel economy experience on the road. The majority of the report delas with the derivation of mathematical algorithms that could be used to perform the needed adjustment. Using an extensive data base of in-use fuel-economy, algorithms are developed which depend on certain design features of motor vehicles. Substantial improvements in the accuracy of the Fuel Economy Labeling and Gas Mileage Programs will result when adjustments to the current values are adopted.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Fuel consumption Motor vehicles Mathematical models Algorithms Computers	Fuel economy Methodology EPA fuel economy labeling procedure	

18. DISTRIBUTION STATEMENT
Release Unlimited

19. SECURITY CLASS *(This Report)*
unclassified

20. SECURITY CLASS *(This page)*
unclassified

22. PRICE

EPA Form 2220-1 (9-73)

PB83-144162

EPA/AA/CTAB/FE-82-6

Technical Report

Analysis of In-Use Fuel Economy Data: Stage I

Manuscript Completed
August, 1982

NOTICE

Technical Reports do not necessarily represent final EPA decisions or positions. They are intended to present technical analysis of issues using data which are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments which may form the basis for a final EPA decision, position or regulatory action.

U. S. Environmental Protection Agency
Office of Air, Noise and Radiation
Office of Mobile Sources
Emission Control Technology Division
Control Technology Assessment and Characterization Branch
2565 Plymouth Road
Ann Arbor, Michigan 48105

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Technical Report

Analysis of In-Use Fuel Economy Data: Stage I

Manuscript Completed
August, 1982

NOTICE

Technical Reports do not necessarily represent final EPA decisions or positions. They are intended to present technical analysis of issues using data which are currently available. The purpose in the release of such reports is to facilitate the exchange of technical information and to inform the public of technical developments which may form the basis for a final EPA decision, position or regulatory action.

U. S. Environmental Protection Agency
Office of Air, Noise and Radiation
Office of Mobile Sources
Emission Control Technology Division
Control Technology Assessment and Characterization Branch
2565 Plymouth Road
Ann Arbor, Michigan 48105

FOREWORD

This report summarizes the need for, and the background work done on, adjusting the EPA MPG values to more closely correspond to actual fuel economy experience on the road. The majority of the report deals with the derivation of mathematical algorithms that could be used to perform the needed adjustment. Using an extensive data base of in-use fuel economy, algorithms are developed which depend on certain design features of the vehicles. Substantial improvements in the accuracy of the Fuel Economy Labeling and Gas Mileage Guide Programs will result when adjustments to the current values are adopted.

Most of the data upon which this report is based comes from sources entirely independent of the Environmental Protection Agency. They have in most cases been screened to eliminate "bad" data before being submitted to the Agency. In the absence of independent knowledge of what the distribution of mpg important factors should be, it is difficult to evaluate each source or to detect the presence of sampling or data processing errors in the data.

Thus, it was learned after the body of this analysis was completed, that data supplied by Ford Motor Company for model years 1979 through 1980 included incorrectly coded city fraction values. This error casts doubt on some details of the bi-modal analyses presented in Chapter IV, Section E. The general agreement between this and the non-modal analysis results, however, suggests that the error is not fatal.

The reader's attention is, therefore, directed to the Stage II Report of this series for an updated analysis of an even larger in-use data base in which the Ford data processing error has been corrected. This Stage I Report remains useful as a complete description of the analysis methodology and comparison of the effects of various technological factors on the in-use fuel economy shortfall.

CONTENTS

I. EXECUTIVE SUMMARY I-1

II. BACKGROUND II-1

III. THE DATA III-1
- A. Data Sources III-1
- B. Data Preparation III-18
- C. Data Screening III-30

IV. ANALYSIS IV-1
- A. Data Source Characterization IV-1
- B. Consensus Findings IV-20
- C. Second Stage Screening IV-25
- D. Adjustment Algorithm, Non-Modal IV-34
- E. Adjustment Algorithms, Bi-Modal IV-70

V. EVALUATION OF CANDIDATE LABELING APPROACHES V-1
- A. Methodology V-1
- B. Test Fleets. V-2
- C. Evaluation of Labeling Approaches. V-5
- D. Conclusion V-20

VI. ACKNOWLEDGMENTS. VI-1

APPENDIXES

- A. The Fuel Economy Influence Index
- B. Source-Specific Analyses
- C. Analysis of Perceived vs. Measured Fuel Economy
- D. Non-Modal and Bi-Modal GPM Ratio Relation
- E. Listing of Model Type Data Base
- F. Histograms of Label Error

I. EXECUTIVE SUMMARY

A. PURPOSE

This study has two purposes -- to analyze in-use fuel economy data and to develop adjustment approaches that might be used for changes to the EPA fuel economy labeling procedure.

B. THE DATA

The data base used for this report is a sampling of the on-road fuel economy of more than fifty thousand vehicles. Built by eighteen manufacturers in the U.S., Japan, Germany, Sweden, France and Italy, these vehicles were operated in all States of the U.S., plus the District of Columbia and Puerto Rico, and were operated during all months of the year. We estimate they accumulated nearly three hundred million vehicle miles and consumed some eighteen million gallons of motor fuel during their survey intervals.

Data originating outside of EPA were furnished by four organizations: Chrysler Corporation, the U.S. Department of Energy (DOE), Ford Motor Company, and General Motors. The Chrysler and Ford data are actual measurements gathered by company employees driving Chrysler and Ford lease cars in ordinary consumer service. The DOE data are of three basic types: consumer-measured MPG data, consumer-perceived MPG data, and annualized measured MPG data from commercial fleets. The GM data come from postcard logs gathered in nationwide samplings of private vehicle owners. The EPA data all come from the Emission Factors program, and include some measured postcard data and some perceived-MPG data.

The following table lists the vital statistics of this data base.

Summary of On-Road FE Data Base Characteristics
(all data sources)

Total No. Data Points: 52,780

By Data Source:

Ford	GM	Chrys	DOE	EPA
30267	10357	1282	9228	1646

By Model Year:

1975	1976	1977	1978	1979	1980	1981
2246	2160	3424	16189	13027	14183	1551

By Technology:
(not additive)

Rear Drive	Automatic	Carbureted
48425	45126	50928
Front Drive	**Manual**	**FI & Diesel**
4355	7654	1852

By Manufacturer:

Ford	GM	Chrys	AMC	VW+AP	Datsn
33285	12560	4427	698	486	362
Honda	**Toyta**	**Mazda**	**Volvo**	**Peugo**	**MerBz**
307	236	157	77	58	56

(balance of 71 divided among 6 others:
BMW, Subru, Fiat, Renau, Saab, Alfa)

By Month:

Jan	Feb	Mar	Apr	May	Jun	
840	2355	1362	1820	3661	4054	
Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Unk**
1200	342	387	2552	2091	1047	1649

plus ... "Winter": 7934 "Summer": 13470 "Annual": 8016

By State:
(estimated)

Calif	Texas	NYork	Ohio	Penns	Illin	
4980	1730	1130	1940	1110	1210	
Flori	**Michi**	**NJers**	**Georg**	**NCaro**	**Indi**	**Unk**
660	22160	690	490	350	670	7370

(balance of 8290 divided among 40
other states, incl. D.C and P.R.)

C. DATA PREPARATION

This study utilized substantial personnel and computer resources, not counting precursor in-house studies nor the resources expended by those who supplied the data. Over two thirds of these in-house resources went into the building and verification of computer tools for data management and analysis, and pre-analysis use of these tools.

Five major operations were performed on the data to prepare it for analysis:

- Format Standardization - The data set from each data source was furnished in a format unique to that source. A standard format was established and all data converted to that standard format.

- Augmentation - Given only two measures, the time (month) of driving and the place (ZIP code or, for some data, telephone area code), additional information on fuel economy influences can be added to the data, to augment it. From our own data banks, which contain climatic, topographic, and demographic data, the reformated raw data were augmented with such parameters as temperature, elevation, topographic code, road condition, and other important fuel economy influences.

- EPA MPG Assignment - Using vehicle specifications such as car line name, engine displacement and transmission type, the EPA City, Highway, and Combined MPG figures were assigned to each vehicle in the data base by accessing in-house fuel economy data files.

- Technology Coding - To permit analysis of various combinations of vehicle technologies, the in-use data were coded with respect to front or rear wheel drive, transmission type, fuel system type (carbureted, fuel injected or Diesel), and body type, using a large array of lookup files.

- Influence Indexing - Formulae describing the relative fuel consumption impact due to in-use influences (such as temperature) were developed, and an overall index of their cumulative influence was computed and assigned to each vehicle. This cumulative influence is called the Influence Index. This is a concept long needed in on-road fuel economy analysis, and this study has advanced the state of the art in quantitatively accounting for the effect of on-road influences experienced in actual use. The influence index was used only to screen the data for outliers. It did not figure in the adjustment algorithms.

D. ANALYSIS AND MAJOR FINDINGS

Extensive characterization analysis of each source's data was carried out prior to either rejecting data or aggregating it and analyzing it en masse. This was done for two reasons: first, to apply consistent analytic methods (our own) to each of the sources' data in order to verify findings reached and published by them separately using only their own data and methods; and second, to assess what consensus findings emerge from the group of surveys, treated as independent attempts to quantify in-use fuel economy. Four conclusions derive from that characterization analysis:

.... Consensus Findings: Source-Specific Data ....

- No conclusions reached by the separate sources, as far as they went, are opposite our own findings using their data.

- There is a shortfall. The separate sources' data are unanimous on this point. Comparing overall road MPG with overall EPA MPG, every source's data set shows a shortfall. Furthermore, the magnitude of the average shortfall is amazingly consistent: all source data sets place the average shortfall between 15% and 18%, with the single exception of the DOE perceived-MPG data at 9%.

- There are statistically significant differences between the shortfalls of various vehicle technologies. The sources are in majority agreement that the shortfalls of various technology classes fall into three statistically distinguishable groups, ranked below from best to worst (unranked within each group):

> Low (Best) Shortfall: front wheel drive manuals, rear wheel drive Diesels, and rear wheel drive fuel injected manuals;
>
> Average Shortfall: front wheel drive automatics, rear wheel drive carbureted manuals, and rear drive fuel injected automatics;
>
> High (Worst) Shortfall: rear wheel drive carbureted automatics, a class by themselves.

Note: our subsequent analysis of all of the data, aggregated, confirms the above grouping except that rear wheel drive carbureted manuals and rear wheel drive fuel injected automatics fall into the Low Shortfall group. Our own grouping of technology-dependent shortfall is statistically supported at a confidence level exceeding 98%.

- For most vehicle technologies, road shortfalls become worse for higher EPA MPG levels. Two notable exceptions to this finding are fuel injected automatics (both front and rear wheel drive), which show decreasing shortfall with increasing MPG. (Our subsequent analysis found this to be caused by differential shortfall as a function of engine size.)

Prior to the development of adjustment factors, the data base was screened to evaluate data applicability to the mid-1980's time frame. This screening led to three major conclusions:

- Engines of 400 or more cubic inches displacement are not appropriate in a data base to be used to develop MPG adjustments for the future. Engines this large have not been used in passenger cars since 1979, except for Rolls-Royce cars. Data from vehicles with engine displacements greater than or equal to 400 cubic inches were not used.

- There is no model year trend in road fuel economy offset which warrants deletion of any model years' data. In fact, it is particularly important to retain data from the 1976 to 1978 model years, to assure representation of the 1975 test rigor relaxation that occurred then and is occurring now with respect to manual transmission shift schedules.

- Perceived-MPG data and fleet car data disagree with each other and with measured-MPG consumer data. These two classes of data are not appropriate for use in developing MPG adjustments for consumer information. In our opinion, perceived-MPG data has no useful purpose in meaningful on-road fuel economy analysis of any kind. Only consumer-driven, measured fuel economy data were used in the development of the adjustment algorithms.

E. MPG ADJUSTMENT METHODS

The general form of any fuel economy label adjustment is a formula,

$$\boxed{L = A(E)}$$

where E is the EPA MPG number to be adjusted, A is an adjustment operation performed on the EPA number, and L is the resulting label MPG number.

As explained in the text, the most accurate adjustment operation is division of the EPA number by a fuel consumption ratio,

$$\boxed{L = E/GPMR}$$

where GPMR is Gallons-Per-Mile Ratio, the ratio of road fuel consumption to EPA fuel consumption; this ratio is greater than 1.0 whenever road fuel consumption is higher than EPA fuel consumption.

The analysis determined that this GPMR is dependent upon the EPA number itself, upon the number of engine cylinders, and upon the kinds of technology used in the vehicle type.

Thus the generalized labeling formula is

$$\boxed{L = E/[GPMR = f(E, Ncyl, Tech)]}$$

where Ncyl is number of cylinders and Tech indicates the combination of specific technology descriptors for the vehicle type. GPMR = f( ) indicates functional dependence of GPMR upon the variables within the parentheses.

The full equation for the GPMR function is

$$\boxed{\begin{aligned} GPMR = 1.097 + .0059(E) + .0085(N-8) + FWD(-.185 + .03N) \\ + MAN(-.070) + INJ(-.184 + .0225N) + DSL(-.142) \end{aligned}}$$

where E is the EPA MPG number to be adjusted, N is the number of cylinders, FWD = 1 if the vehicle type is front wheel drive and 0 if not, MAN = 1 if the vehicle is equipped with a manual transmission and 0 if not, INJ = 1 if the vehicle is equipped with gasoline fuel injection and 0 if not, and DSL = 1 if the engine type is Diesel and 0 if not.

Thus, GPMR is represented as a sum of deviations from the GPMR value for rear wheel drive, automatic transmission, carbureted gasoline engine vehicles.

Effectiveness of the Technology-Specific Adjustment

This adjustment formula is applicable to any and all of the EPA numbers and was compared to several alternatives. The alternatives evaluated ranged from simplistic adjustments ($\text{LABEL}_{\text{city}} = 0.90 \times \text{EPA}_{\text{city}}$, etc.) to separate city and highway formulae, both with the above general form for the GPMR function. The recommended formula was actually developed on data which represented overall driving and is also an adjustment for a one-number fuel economy label system.

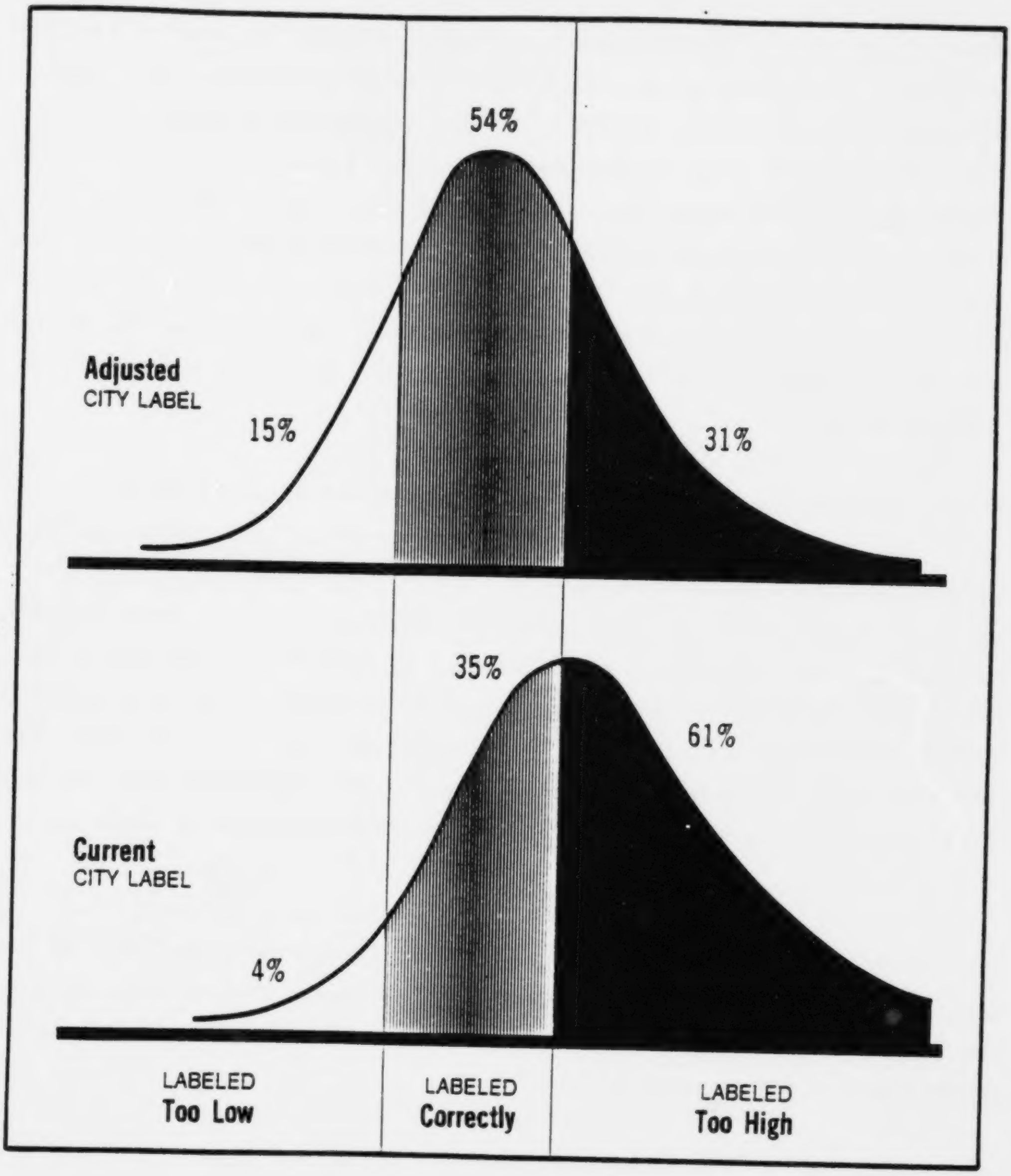
In testing of all of the alternative adjustment methods, a systematic procedure was used to rank the methods in terms of their effect upon the distribution of error between calculated Label MPG values and actual road MPG from the in-use data base. In the use of this adjustment evaluation procedure, the technology-specific formula performed essentially as well as the best sets of separate city and highway adjustments; moreover, it performed better than they did in two important ways: it produced no reversals in highway vs. city labeling (i.e. no cases with calculated highway label MPG lower than calculated city label MPG), and it showed a higher inclusion range (more than 70% of overall in-use fuel economy is captured within the range bounded by this formula's adjusted city and highway figures).

It should be noted that evaluation of the alternative adjustments was done with both model-type average data and raw (disaggregate) data. The use of model type average data is valid in terms of what EPA has said the labeling system should be: an estimate of the average road MPG for all cars within a model type. By averaging out the wide scatter in individual cars' in-use MPG, improvement in label accuracy for all systems can be shown. However, use of disaggregate data in such tests is also valid, reflecting what the driving public seems to be insisting the labeling system should provide: an estimate of the road fuel economy of every individual vehicle. We maintain that such an expectation provides the analyst with a most difficult task. Nevertheless, we tested the alternatives against this expectation, defining "success" in terms of hitting within 10% of each vehicle's road MPG: indeed a demanding test.

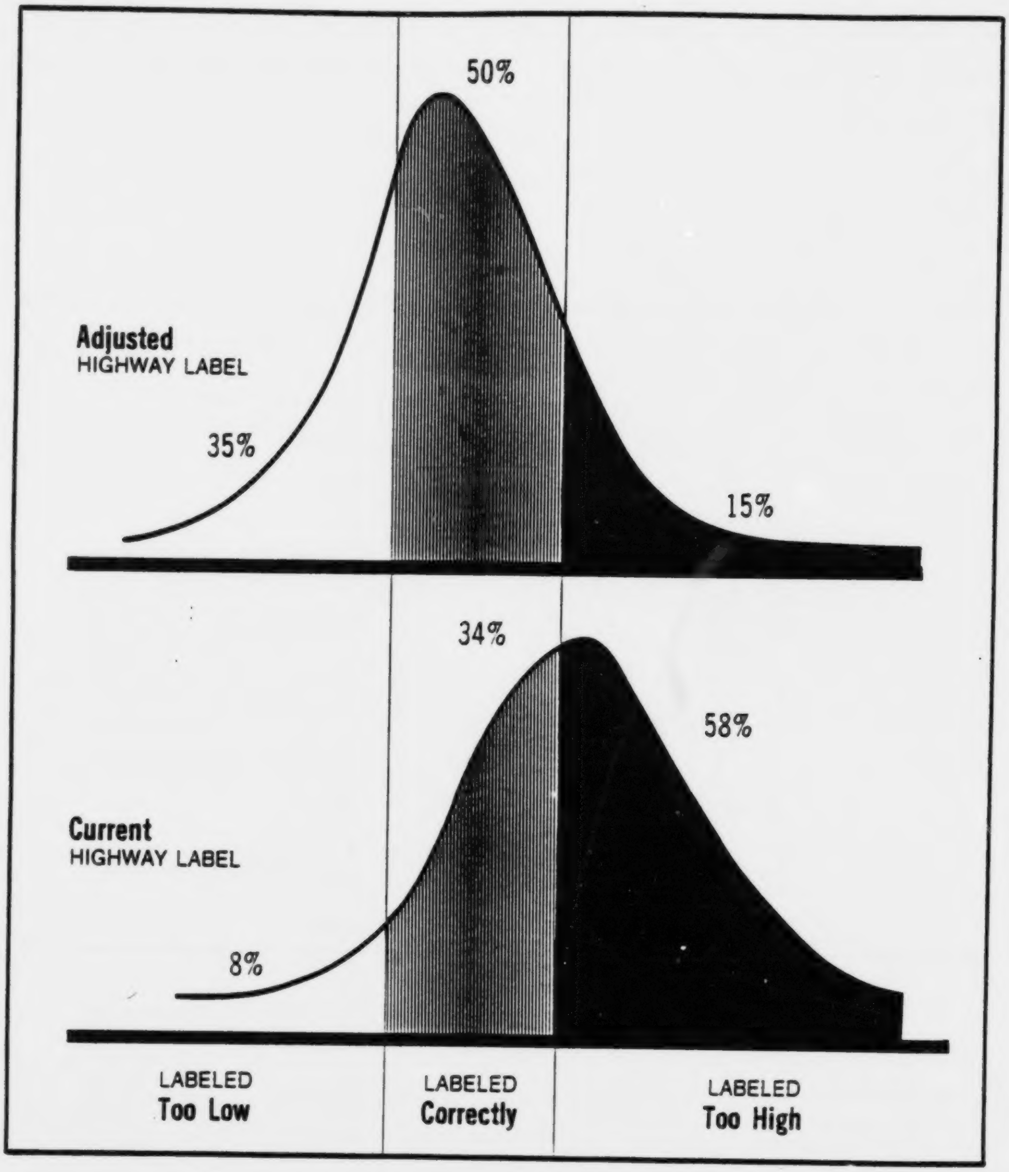
The figures overleaf are examples of distributions of label error in this test. The example shown is for the technology-specific formula and for the current (unadjusted) labeling system. The vertical band in each figure spans the range from -10% label error to +10% label error. That portion of the distribution within this band consists of cars whose road MPG is within 10% of the label value. They are "correctly labeled". The left-hand tail of each distribution contains all the individual cars for which label MPG is less than road MPG: they are "underlabeled". The right-hand tail includes "overlabeled" cars: the label number is too high compared to their actual road MPG.

The technology-specific adjustment correctly labels more than half of the city-driven cars, where the current system succeeded for only one third of the cars. For highway-driven cars, the adjustment's improvement in label correctness is almost exactly the same.

More dramatically, the technology-specific adjustment cuts the fraction of city cars overlabeled from 60% to less than a third, and cuts the fraction of highway cars overlabeled from nearly 60% to less than 20%.



Labeling Accuracy of Formula Adjustment and Current System:
CITY-DRIVEN CARS



Labeling Accuracy of Formula Adjustment and Current System:
HIGHWAY-DRIVEN CARS

Implementation of the Technology-Specific Adjustment

To implement the technology-specific adjustment for a small number of model types, solution of the adjustment formula is quite easily done case by case on a programmable pocket calculator. A pocket calculator program is listed below.

```
SETUP:     1.097   STO 0          .01    STO 3            .0059   STO 6
-----       .0085  STO 1         .0225   STO 4
            .185   STO 2          .142   STO 5
-----------------------------------------------------------------------
PROGRAM:    1  RCL 0                     25  RCL 7
-------     2  R/S < KEY IN NO. CYLS     26  RCL 4
            3  STO 7                     27  X
            4  8                         28  RCL 3
            5  -                         29  1
            6  RCL 1                     30  0
            7  X                         31  ÷
            8  +                         32  RCL 2
            9  3                         33  -
           10  RCL 3                     34  +
           11  X                         35  R/S < KEY IN 1 IF INJ.
           12  RCL 7                     36  X            0 IF NOT
           13  X                         37  +
           14  RCL 2                     38  RCL 5
           15  -                         39  R/S < KEY IN 1 IF DSL.
           16  R/S < KEY IN 1 IF FWD.    40  X            0 IF NOT
           17  X            0 IF NOT     41  -
           18  +                         42  R/S < KEY IN EPA MPG
           19  7                         43  ÷
           20  RCL 3                     44  RCL 6
           21  X                         45  +
           22  R/S < KEY IN 1 IF MAN.    46  G 1/X
           23  X            0 IF NOT     47  R/S < READ LABEL MPG
           24  -                         48  GTO 01

              (PRESS R/S AFTER EACH KEY-IN OR READ)
```

To perform the adjustment on a computerized data base, a simple FORTRAN program, listed below, can be used. It calculates adjusted label MPG values for 1000 model types in fourteen seconds, at a cost of $1.90.

```
CC  $RUN  [OBJECT CODE]  5= [INPUT FILE]   6= [OUTPUT FILE]
      REAL*8 NAM1,NAM2
      REAL MANF,MDLY,NOBS,IWGT
      DIMENSION EPA3(3),ALABEL(3),GPMR(3)
      DATA CHF,CHM,CHI,CHD/'F','M','I','D'/
   10 FORMAT(F3.0,F4.0,F3.0,A4,1X,2A7,F5.0,F3.0,4A1,F6.0,3F5.1,F5.0,
     + F6.3,F5.1,F6.3,F6.0,F4.0,3F6.2)
   20 READ (5,10,END=40) SORC,MANF,MDLY,ESTD,NAM1,NAM2,ECID,ECYL,DVTYP,
     + TRTYP,CFID,BOTYP,NOBS,EPA3,CTYF,EOGR,ROAD,AOGR,IWGT,CLAS
      FWD  = 0.
      TRN  = 0.
      FINJ = 0.
      DSL  = 0.
      IF(DVTYP.EQ.CHF) FWD = 1.
      IF(TRTYP.EQ.CHM) TRN = 1.
      IF(CFID.EQ.CHI) FINJ = 1.
      IF(CFID.EQ.CHD)  DSL = 1.
      DO 30 I=1,3
      GPMR(I)= 1.097 + .0059*EPA3(I) + FWD*(-.185 + 0.030*ECYL) - .070*TRN
     A  + FINJ*(-.184 + .0225*ECYL) - .142*DSL + (ECYL - 8.)*.0085
      ALABEL(I) = EPA3(I)/GPMR(I)
   30 CONTINUE
      WRITE(6,10)  SORC,MANF,MDLY,ESTD,NAM1,NAM2,ECID,ECYL,DVTYP,TRTYP,
     + CFID,BOTYP,NOBS,EPA3,CTYF,EOGR,ROAD,AOGR,IWGT,CLAS,ALABEL
      GO TO 20
   40 STOP
      END
```

II. BACKGROUND

The Environmental Protection Agency has published fuel economy (MPG) values of one sort or another for about ten years. For that same period, the relationship between the EPA fuel economy values and those obtained on the road has been an issue. In the earliest comparison by the EPA, national average MPG estimates using the EPA city values were compared to national average MPG estimates reported by the Department of Transportation. Later, the city test was altered to the one still in use today, the 1975 FTP, and a non-urban or "highway" driving cycle was added. Using the composite (55/45) fuel economy calculated from the EPA city and highway values, comparison with DOT data indicated that the EPA composite MPG overpredicts Road MPG.

Initially, EPA interest in the relationship between the EPA and Road fuel economy values was stimulated by skepticism about the several versions of the Fuel Economy Labeling Program that have existed. The reaction came primarily from consumers who "didn't get the EPA numbers" and to a lesser extent from those studying fuel consumption and making fuel demand projections.

More recently, work on the issue of the EPA to Road shortfall has been reported from several contributors from industry and the private and public sectors.

Working independently in some subject areas and jointly in others, analysts in the automobile industry, the government, and government contractors have developed and improved techniques for in-use data analysis. Important contributions from the automobile industry have come from Ford Motor Company and General Motors. EPA and the Department of Energy have provided the relevant government inputs, and Energy and Environmental Analysis, Inc. and Falcon Research and Development Co. have been the significant contractors in the overall effort.

Collectively this group of organizations has developed and refined the concepts of (1) expressing the measure of EPA-to-Road MPG offset as the ratio of Road fuel consumption to EPA fuel consumption, (2) model type averaging,

(3) differential usage among various vehicles, (4) seasonal effects, (5) the use of city driving fraction as a key influence variable, and (6) the recognition of vehicle technology differences as an important factor in Road MPG offset behavior.

Much of the analysis in this report builds on this earlier work. The incremental advances made herein are: the conceptualization of the "influence index", a more detailed investigation of vehicle technology parameters as shortfall-influences, and a systematic procedure for comparing competing fuel economy labeling schemes. Only the influence index and labeling evaluation procedure are new. The dependence of road MPG offset upon vehicle technology has been well known for years. The contribution made here is to refine and quantify the technology-dependency relationship for vehicle types that populate today's and tomorrow's fleet.

The purpose of this report is to analyze existing Road fuel economy data and to develop fuel economy adjustments that can improve the MPG values presented to consumers by the government (Fuel Economy Labels and the Gas Mileage Guide). First, however, some nomenclature and definitions are necessary. The following terms are used in a special way in this report and by others analyzing in-use fuel economy.

GPMR - The Gallons Per Mile Ratio, a ratio of the fuel consumption (gallons per mile) at one condition to the fuel consumption at another. The fuel consumption values of interest in this report are the Road fuel consumption and one of the various EPA fuel consumption values.

Influence Index - The influence index is a measure of the net effect of a combination of fuel economy-influencing variables. An index greater than unity indicates an influencing factor combination that increases fuel consumption (reduces fuel economy). An index less than unity indicates an influencing factor combination which improves fuel economy. Functionally, the influence index is supposed to explain why a vehicle achieves the GPMR that it does, in terms of the influences it was subjected to. A well-formulated influence index should approach equality to each vehicle's GPMR value. Although the influence index has promise for several applications, it was used here only to screen data, because it is still developmental. This index is discussed further in Appendix A.

Technology Shorthand - Certain aspects of vehicle technology, important for reasons of analysis and accessible in in-use data bases, are represented by a shorthand notation, three letters and a number. The first letter is either R or F, for Rear-wheel or Front-wheel drive; the second is A or M, for Automatic or Manual transmission; and the third is C, I, or D, for Carburetion, gasoline fuel Injection, or Diesel. The number is the number of cylinders. Counting the four most important cases (4, 5, 6, and 8), there are 48 classes that could be populated. Because there are so few 5-cylinder cars, they are sometimes merged with the 6-cylinder cars when describing vehicle fleet attributes. For most of the analysis in this report, 29 classes were populated.

Diffuse and Model Type Data - These two descriptors describe the data used in the analysis. In-use fuel economy data shows an amazing amount of scatter. This reflects to some extent the difficulty of the analysis problem. Since this "as is" data looks like a diffuse cloud when plotted, the term diffuse was coined to distinguish it from model type data. Of the many ways to aggregate in-use data, we have chosen an approach which averages together the data from vehicles that are "like each other". Our definition of "like each other" corresponds to the model type definitions used for the current fuel economy labeling program. The use of this model type data reduced the data base by more than an order of magnitude and was important in obtaining a better understanding of the pertinent influences, since individual-vehicle scatter is reduced when numbers of vehicles are averaged together.

Non-Modal and Bi-Modal - These describe one or another of two analysis issues. This report investigates the adjustments needed for a fuel economy labeling program which uses only one MPG value and also investigates the adjustments that would be needed for a fuel economy labeling program which uses two MPG values. The analysis and discussion of the one MPG value adjustment is called by the names Non-Modal and overall in this report. The two MPG value work is referenced by the terms Bi-Modal, 2-number and city and highway.

Analysis Space - During DOE's studies it became obvious that evaluation of the EPA versus Road MPG issue by merely looking at the Road MPG on one axis and the EPA MPG on another suffers from technical inaccuracy. After some rigorous investigation, a space was developed in which the GPMR, road fuel consumption divided by EPA fuel consumption, was the dependent variable and the appropriate EPA fuel economy the independent variable. This is called "analysis" space in this report.

From engineering considerations it has been shown that the GPMR should be a linear function of EPA MPG in analysis space. That is why only linear regressions in analysis space are used in this report. However, a linear relationship in analysis space maps into a curve in Road MPG versus EPA MPG space.

III. THE DATA

A. DATA SOURCES

The data base accumulated and analyzed for this report covers some 53,000 cars built by 18 manufacturers in seven model years.

Eight in-use fuel economy survey data sources make up this data base, each source being a unique combination of surveyor, type of survey, and quality and completeness of data. Table III-1 presents vital statistics for the overall data base.

Eighty percent of the data were furnished by three auto manufacturers: Chrysler, Ford, and General Motors; the remaining 20% were collected by DOE and EPA (mostly DOE). Eighty percent of the data represent three model years, 1978 through 1980, primarily because the largest data source (Ford) is concentrated in those three years.

The three-character vehicle technology categories shown in Table III-1 are coded as discussed earlier: "RAI" vehicles are rear-wheel drive, automatic, fuel injected vehicles, "FMC" vehicles are front-wheel drive, manual, carbureted vehicles, etc. Eighty percent of the data are for RAC vehicles; only 27 data points exist for RMD vehicles.

Manufacturer representation is dominated by Ford, due to the large sample size of Ford's surveys of its own models.

Distribution of the data by month/season shows a slight bias toward the Summer months (44% of the data, compared to 28% Winter and 28% Spring/Fall).

Table III-1

Summary of On-Road FE Data Base Characteristics
(All Data Sources)

Total No. Data Points: 52,780

By data source:

Ford	GM	DOE-f	Chrys	EPA-m	DOE-p	EPA-p	DOE-m
30267	10357	8016	1282	1011	807	635	405

By model year:

1975	1976	1977	1978	1979	1980	1981
2246	2160	3424	16189	13027	14183	1551

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
42110	623	396	5063	206	27

FAC	FAI	FAD	FMC	FMI	FMD
1772	154	71	1983	236	139

By manufacturer:

Ford	GM	Chrys	AMC	VW+AP	Datsn
33285	12560	4427	698	486	362

Honda	Toyta	Mazda	Volvo	Peugo	MerBz
307	236	157	77	58	56

(Balance of 71 divided among 6 others:
BMW, Subru, Fiat, Renau, Saab, Alfa)

By month:

Jan	Feb	Mar	Apr	May	Jun
840	2355	1362	1820	3661	4054

Jul	Aug	Sep	Oct	Nov	Dec	Unk
1200	342	387	2552	2091	1047	1649

plus ... "Winter": 7934 "Summer": 13470 "Annual": 8016

By state:
(estimated)

Calif	Texas	NYork	Ohio	Penns	Illin
4980	1730	1130	1940	1110	1210

Flori	Michi	NJers	Georg	NCaro	Indi	Unk
660	22160	690	490	350	670	7370

(Balance of 8290 divided among 40
other states, incl. D.C and P.R.)

This page intentionally
blank and un-numbered

The geographic spread of the data is heavily biased toward Michigan, with 42% of the data. The twelve States listed in Table III-1 are listed in order of decreasing annual vehicle miles traveled; together they account for 57% of total U.S. VMT*. The general overrepresentation of Northern-tier states (78% of the data for these 12 states) compensates for the aforementioned overrepresentation of the Summer months, however; using DOE-developed data** on the effects of season and geographic region on in-use fuel economy, the average MPG error for our data base is estimated at less than 0.2 MPG (a 1% error), compared to the true time-space distribution of in-use cars.

The paragraphs following describe each of the eight survey data sources.

Chrysler Corporation

In the Spring of 1981, Chrysler surveyed the in-use Fuel economy of some 1300 lease cars operated by its employees in commuter/personal service. The cars were all 1981 model Chrysler products, and were split roughly equally between rear-drive automatics, front-drive automatics, and front-drive manuals (all carbureted). Over 80% of the cars were operated in southeastern Michigan, but there are some data from each of 27 other states.

The statistics for this data source are given in Table III-2. The data base did not include figures on miles traveled per day or dates for the survey interval.

---

* U.S. Department of Transportation, FHWA, Highway Statistics 1977, annual.

** Unpublished; draft report in preparation.

Table III-2

Summary of Data Source Characteristics

Data source: Chrysler Corp. (Measured MPG)

Survey method: Questionnaire on on-road fuel economy of lease cars operated for personal transportation by Chrysler Corporation supervisory/management personnel. Overall in-use MPG figures, not fuel/odometer log, but 95% of the survey data are based on measurements rather than perceptions. (Chrysler vehicles only.)

No. data points: 1282

By model year:

1975	1976	1977	1978	1979	1980	1981
						1282

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
430	3		1		
FAC	**FAI**	**FAD**	**FMC**	**FMI**	**FMD**
579			269		

By month: Survey ran Feb 81 thru Jun 81; April assumed.

By state:

Michi	Indi	Ohio	Alaba	NYork
1064	57	34	28	21

(Balance of 78 divided among 23 other states.)

Key parameters missing:

Location (state, ZIP)	Odometer	% City driving
Time (month) *a	Miles/day X	Other:

*a ... estimated based on survey time interval

DOE Fleet Data

This data source covers 8000 cars operated in fleet service. Five model years are represented. This data base is unique in that one full year of operation is represented for each vehicle. Practically all the vehicles (99.5%) are rear-drive automatic carbureted technology. Some 6000 of the data records come from the Runzheimer Co., a commercial marketer of data on vehicle operation and cost statistics; another 1700 of the fleet cars are from state Departments of Transportation. Except for these State fleets, the locations where the cars were operated are not identified in the data. Table III-3 gives the statistics for this data base, with individual sources of data and their model year breakout shown in Table III-4. Unfortunately, city driving fraction and miles traveled per day are not specified, which prohibits quantitative study of the operating characteristics for these cars.

DOE Measured-MPG Data

This source, 405 cars, is the smallest data source used in this study. The "typical" vehicle in this data base is part of a small fleet used by an oil company for periodic tests on emissions and octane requirements. Between such tests, the vehicles are operated for mileage accumulation purposes by company employees in ordinary personal transportation service. The vehicles were usually rotated among several employee operators for an interval on the order of one month each. In-use fuel economy is computed from odometer mileage and fuel purchase records kept by each operator. As with the DOE fleet data, this data base does not include data on the time or location of vehicle travel, nor the city fraction or daily mileage accumulation. Table III-5 gives statistics for this data source. Six model years are covered, and three-fourths of the cars are rear-drive automatic carbureted technology. The respective number of cars for individual contributors to the DOE measured data are given in Table III-6.

Table III-3

Summary of Data Source Characteristics

Data source: Dept. of Energy (Fleet MPG)

Survey method: Fleet record-keeping system, with odometer mileage and fuel purchases summed quarterly, and four such sum pairs used to compute annual MPG.

Table III-4 lists individual sources of DOE fleet MPG data, and the respective number of cars involved.

No. data points: 8016

By model year:

1975	1976	1977	1978	1979	1980	1981
	48	2881	3093	1861	133	

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
7977		24	10		

FAC	FAI	FAD	FMC	FMI	FMD
					5

By month: Data represent annual average MPG.

By state:

Maryl	Wisco	Illin	Tenne	Maine	Unk
994	506	162	81	3	6270

Key parameters missing:

Location (state, ZIP)	X	Odometer		% City driving	X
Time (month)	X	Miles/day	X	Other:	

Table III-4

Individual Sources of DOE Fleet Data and Number of Cars by Model Year

Source	1975	1976	1977	1978	1979	1980	Total
AT&T		40	75	17	14	3	149
Illinois DOT			99	63			162
Maine DOT			3				3
Maryland DOT		8	463	523			994
Runzheimer			2109	2348	1662		6119
Tennessee DOT			47	34			81
Wisconsin DOT			83	108	185	130	506
N. L. Wuertz			2				2
Total		48	2881	3093	1861	133	8016

Table III-5

Summary of Data Source Characteristics

Data source: Dept. of Energy (Measured MPG)

Survey method: Vehicles were used for personal transportation by employees of the companies; MPG was computed from records kept by these employees. Surveys were run over periods of 1-3 months.

Table III-6 lists individual sources of DOE measured MPG data, and the respective number of cars involved.

No. data points: 405

	1975	1976	1977	1978	1979	1980	1981
By model year:	2	12	121	175	49	46	

	RAC	RAI	RAD	RMC	RMI	RMD
By technology:	317	2	24	19		4
	FAC	FAI	FAD	FMC	FMI	FMD
	19		1	3		16

By month: Not identified.

By state: Not identified.

Key parameters missing:

Location (state, ZIP) X

Odometer

% City driving X

Time (month) X

Miles/day X

Other:

Table III-6

Individual Sources of DOE Measured Data and Number of Cars by Model Year

Source	1975	1976	1977	1978	1979	1980	Total
American Oil		5	27	25		31	88
Atlantic-Richfield				26	11	2	39
DOE Diesel collection	2	1	5	12	20	6	46
Dupont Chemical				40			40
Libby-Owens-Ford				55			55
Mobil Oil		3	9	6			18
Shell Oil		3	22	11	18	7	61
Texaco			58				58
Total	2	12	121	175	49	46	405

DOE Perceived-MPG Data

This, the third data source from DOE, comes from a questionnaire survey of nearly 10,000 vehicle owners. The survey, conducted by the J.D. Power company under contract to DOE, was a nationwide multi-manufacturer survey covering vehicles of model years 1978 and 1979.

There are a number of problems with this data source. The principal problem is that it is not measured vehicle fuel economy data at all; it is data on the owners' perceptions of their vehicles' on-road fuel economy. On-road fuel economy, in fact, was an incidental part of the survey, whose primary purpose was to solicit opinions on fuel economy information and fuel supply crisis issues.

Another serious problem with this data is the lack of sufficient vehicle information to permit accurate assignment of EPA MPG values; specifically, engine displacement was not recorded for the vehicles. The survey did collect data on the number of cylinders, but in many cases this is a marginally useful parameter. For example, many 1978 and 1979 vehicles were available with three or four different sizes of 8-cylinder engines, ranging from about 300 cubic inches to about 450 cubic inches.

Yet another problem with this survey is that respondents were not asked to identify whether their vehicle had a Diesel engine. Since cars were available with gasoline and Diesel engines with the same cylinder count (most notably, GM 8-cylinder and VW 4-cylinder), identification of "Dieselity or non-Dieselity" for this data base is a tricky business fraught with pitfalls.

In addition to these problems, wherein critical parameters are not included on any of the cars surveyed, there are numerous instances where respondents did not log key variables that were sought, such as cylinder count, transmission type, or car line. When all that is known about a data record is that it was an "Other" or "Unspecified" or "2-door" vehicle from manufacturer X, it is a totally useless record in terms of identifying what its EPA

MPG value should be. Even the questionnaire's inclusion of a blank in which respondents could indicate what they thought the EPA MPG numbers were for their car is not always useful: errors as high as 15 MPG were found in this data (owner perception of EPA MPG erred as much as 15 MPG).

Because most of these problems occurred in RAC and RMC technologies, and because these technologies are already well-populated by other data sources, we used only non-RAC and non-RMC data (less than 10% of the original data), working with that as best we could.

Table III-7 gives the statistics for this data source.

EPA Measured-MPG Data

Beginning in 1980, a small sample of the participants in EPA's Emission Factors Program have participated in a "Postcard Survey" in which they note odometer readings and fuel quantities for about six successive fuel purchases; at least the first and last purchases are required to be fillups. This measured-MPG survey is a multi-model year, multi-manufacturer data source, with vehicle technologies covered roughly in the proportions they occur in the overall fleet. Because (to date) the Emission Factors contractors doing the surveying do not have Diesel emission test capability, no Diesels are included in the Postcard survey. In addition, again because of the finite number of contractors in the program, geographic coverage of in-use vehicles is highly localized rather than nationwide.

A little over 1000 cars are included in the current data base as of the end of October 1981. Table III-8 gives the statistics for this data source.

EPA Perceived-MPG Data

Since 1975, all of the participants in the EPA Emission Factors program have filled out a detailed questionnaire on travel and maintenance practices for their vehicles. One of the responses sought is the owner's estimate of in-use MPG in city, highway, and overall driving. While we have not rigorously

Table III-7

Summary of Data Source Characteristics

Data source: Dept. of Energy (Perceived MPG, "J.D. Power")

Survey method: Mailed questionnaire soliciting new car buyers' opinions on the federal fuel economy information program, and energy/fuel crisis issues. The 1978 survey sought owner estimates of city, highway, and overall on-road MPG; the 1979 survey sought only one (overall) on-road MPG figure. A nationwide random sample selected from vehicle registration files.

No. data points: 807

By model year:

1975	1976	1977	1978	1979	1980	1981
			447	360		

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
	49	108		47	

FAC	FAI	FAD	FMC	FMI	FMD
169	39	4	201	122	68

By month:

Jan	Feb	Mar	Apr	May	Jun
616	121		70		

By state:

Calif	Michi	NYork	Ohio	Texas
112	104	95	76	57

(Balance of 358 divided among 30 other states.)

Key parameters missing:

Location(state,ZIP) -----

Odometer -----

% City driving -----

Time(month) *a

Miles/day -----

Other: Engine CID

*a ... estimated based on survey time interval and questionnaire return dates.

Table III-8

Summary of Data Source Characteristics

Data source: EPA (Measured MPG)

Survey method: Postcard log of fuel purchase quantities and odometer readings. Survey objectives and procedures for filling logs discussed personally with each participant. Sample consisted of car owners participating in EPA Emission Factors in-use vehicle emission surveillance program.

No. data points: 1011

By model year:

1975	1976	1977	1978	1979	1980	1981
38	37	57	134	161	315	269

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
582	10		145	14	
FAC	**FAI**	**FAD**	**FMC**	**FMI**	**FMD**
98	23		112	27	

By month:

Jan	Feb	Mar	Apr	May	Jun
45	91	107	198	183	140
Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
110	68	62	1		6

By state:

Texas	Calif	Colo	Washi	D.C.	Misou
521	257	205	11	10	7

(survey limited to 6 states.)

Key parameters missing:

Location (state.ZIP) -----

Odometer -----

% City driving *a -----

Time (month) -----

Miles/day -----

Other: -------------

*a ... five choices: 0, 25, 50, 75, 100%

pursued analysis of this overall data base due to the issue of perceived MPG data validity, some of these data were furnished to DOE approximately two years ago. This data source is what was used by DOE; its statistics appear in Table III-9.

Ford Motor Company

Ford has been collecting postcard-type measured data on in-use fuel economy of its management lease car fleet since 1978. Two survey waves, Winter and Summer, are conducted each year. Two vehicle technologies, RAC and RMC, 96% of the data, cover practically all of Ford's model lines for 1978-1980; RAI's and FMC's are model-specific, including only throttle-body injection Lincolns (RAI), and Fiestas (FMC). Two-thirds of the data represent Southeastern Michigan driving, but 37 other states are represented -- and not too badly at that, given the very large sample size of the Ford survey. An advantage of a survey such as this, with a sampling frame drawn from company records, is that states which restrict release of their registration data by organizations such as R.L. Polk can still be sampled (e.g., Pennsylvania).

Table III-10 gives statistics for the Ford survey data.

General Motors

GM is probably the originator of the postcard survey method of collecting accurate measurements of in-use fuel economy. Their 1975 and 1976 Winter and Summer surveys, and their 1978 Summer survey, covered privately-owned GM cars; their 1980 Fall survey was expanded to include vehicles from twelve other manufacturers as well. All of the twelve vehicle technologies are included, and geographic (State) coverage is quite uniform.

Statistics for the GM survey data base appear in Table III-11.

Table III-9

Summary of Data Source Characteristics

Data source: EPA (Perceived MPG)

Survey method: Questionnaire on vehicle operation and maintenance practices of participants in EPA Emission Factors program. Owner estimates of city, highway, and overall on-road MPG.

No. data points: 635

By model year:

1975	1976	1977	1978	1979	1980	1981
	260	365	10			

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
322	20	1	187	25	
FAC	**FAI**	**FAD**	**FMC**	**FMI**	**FMD**
11	1		59	9	

By month: Not identified.

By state: Not identified.

Key parameters missing:

Location (state, ZIP)	X	Odometer		% City driving	X
Time (month)	X	Miles/day	X	Other:	

Table III-10

Summary of Data Source Characteristics

Data source: Ford Motor Co. (Measured MPG)

Survey method: Postcard log of fuel purchase quantities and odometer readings. Lease cars operated for personal transportation by Ford Motor Co. supervisory/management personnel. Ford Motor Co. vehicles only.

No. data points: 30,267

By model year:

1975	1976	1977	1978	1979	1980	1981
			10808	10596	8863	

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
25445	382		3550		

FAC	FAI	FAD	FMC	FMI	FMD
			890		

By month: (1980 subset only; 1978-79 assumed similar)

Jan	Feb	Mar	Apr	May	Jun
77	2000	1193	40	341	3727

Jul	Aug	Sep	Oct	Nov	Dec	Unk
962	50	1	1	4	10	457

By state: (1980 subset only; 1978-79 assumed similar)

Michi	Calif	Ohio	Penns	Texas
5898	1117	320	170	137

(Balance of 1221 divided among 33 other states.)

Key parameters missing:

Location (state, ZIP) *a ______ Odometer ______ % City driving __________

Time (month) *b ______ Miles/day ______ Other: ____________

*a ... location based on telephone area code.

*b ... "Winter" or "Summer" for 1978 and 1979.

Table III-11

Summary of Data Source Characteristics

Data source: General Motors (Measured MPG)

Survey method: Postcard log of fuel purchase quantities and odometer readings. Nationwide random sample selected from GM sales records for GM cars, registration records for other cars. Carline quota sampling. 1975,76,78 surveys GM cars only; Multi-manufacturer survey for model year 1980.

No. data points: 10,357

By model year:

1975	1976	1977	1978	1979	1980	1981
2206	1803		1522		4826	

By technology:

RAC	RAI	RAD	RMC	RMI	RMD
7037	157	239	1151	120	23
FAC	**FAI**	**FAD**	**FMC**	**FMI**	**FMD**
891	91	66	449	78	55

By month:

Jan	Feb	Mar	Apr	May	Jun	
102	143	62	230	3137	187	
Jul	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Unk**
128	224	324	2550	2087	1031	152

By state:

Michi	Calif	NYork	Illin	Ohio	Texas	Unk
848	787	780	737	733	677	58

(Balance of 5795 divided among 46 other states, incl. P.R.)

Key parameters missing:

Location (state, ZIP) -----
Odometer -----
% City driving X (1975-78)
Time (month) -----
Miles/day -----
Other: ------------

B. DATA PREPARATION

Four categories of computer software were developed to process in-use fuel economy data:

- Programs for augmenting data and writing it into a standard storage format.
- Command files for cleaning and further coding of the data in standard storage format.
- Command files for quantifying the estimated fuel economy effect of certain influencing parameters, and writing files in standard analysis formats.
- Software for collapsing data in standard analysis formats into model type averages.

Each of these items of software is described below. They are not portable outside of the Michigan Terminal System (MTS), but are portable between MTS accounts.

Software for Augmenting and Storage Formating

XFORM is a FORTRAN program that reads an as-received in-use fuel economy data file and produces an output data file in a standard storage format. The output file is an augmented version of the input data, incorporating topographic, climatic, and demographic parameters in each output record. The augmentation module of XFORM uses each input record's date and zip code to look up these parameters.

Other portions of XFORM perform functions such as Julian date conversion of in-use FE survey dates, computation of a miles-per-day figure, and decoding of engine size codes and car line codes.

The input file formats and coding conventions which XFORM can handle at present are listed below. The complete format layouts for these are available from EPA upon request.

- GM 1975
- GM 76/78
- EPA Emission Factors
- FORD
- JD POWER
- GM 1980
- Chrysler 1981
- The SSFID format

The format for the XFORM output, "SSFID", is given in Table III-12. This is our standard format for storing in-use FE data.

PLUG is a FORTRAN program which assigns EPA City and Highway fuel economy values to a data file in SSFID format. It reads "match fields" specified by the operator, and consults fuel economy data lookup files to find or calculate the EPA FE values appropriate to the level of aggregation associated with the match fields. Sales-weighted harmonic averaging is used.

The program has the unique capability to deal with model name spelling problems, and in so doing it develops an ever-expanding directory of re-spelling conventions. When given a carline name that it cannot find in the lookup files, it offers the operator all carline names which have that record's match field vector. Upon operator choice of a lookup file surrogate for the unretrievable input name, subsequent appearances of that input name are handled internally without further operator intervention.

PLUG dumps data records to which it cannot assign EPA numbers into a reject list in a separate file from the PLUGged data.

Table III-12

Standard Storage Format for In-use Data

Variable	Format	Columns	Field Description
ISCR	I2	1-2	Input data type (format & coding rules) 1=GM76/78 2=Emission Factors 3=GM75 4=Ford 5=GM80 6=Chrysler 7=JDPower 8=this format
NREC	I6	3-8	Record number in input file
MFR	I4	9-12	Manufacturer code
MODEL	5A4	14-33	Model name as input
IW	I5	34-38	Inertia weight
CID	I4	39-42	Engine displacement, cu inches
TRANS	A3	44-46	1st character is A or M, usually 2nd character is no. of forward gears 3rd character is 1=no overd, 2=overdrive
NCYL	I2	48-49	Number of cylinders in engine
CARB	A2	51-52	Carburetion, as follows: 1 Carburetted gas, single barrel, etc. D Diesel FI Fuel injected gasoline T4 Turbocharged gas, 4-barrel, etc. TD Turbocharged Diesel TI Turbocharged gas, fuel injected 7 Carburetted gas, unknown no. of bbls
KLASS	I2	54-55	Car class, based on interior volume
MY	I2	57-58	Model year
STD	A4	60-63	Engine standard: FLDV, CLDD, etc
IZIP	I3	65-67	First 3 digits of respondent ZIP code
IPOP	I8	68-75	Population count for ZIP region
IPDEN	I6	76-81	Population density (pop/sq mi) for ZIP
MONTH	I2	83-84	Month of year when survey data applicable
PCTURB	I3	86-88	Percent of driving done in city
AMPD	I4	89-92	Average miles per day
FECG	F6.2	93-98	City MPG from certification data
FEHG	F6.2	99-104	Hiway MPG from cert data
FECE	F6.2	105-110	City MPG from emission test
FEHE	F6.2	111-116	Hiway MPG from emission test
FECQ	F6.2	117-122	City perceived MPG
FEHQ	F6.2	123-128	Hiway perceived MPG
FEQ	F6.2	129-134	Combined perceived MPG
MAXTMP	I4	135-138	Average max ambient temp (deg F) for month
MINTMP	I4	139-142	Average min ambient temp (deg F) for month
TEMP	I4	143-146	Average ambient temperature for month
HUMAM	I3	147-149	Average morning humidity (%RH) for month
HUMPM	I3	150-152	Average afternoon humidity (%RH) for month
ELEV	I6	153-158	Average elevation (feet) of ZIP region
TOPO	A3	160-162	Surface landform
STATE	14A1	166-179	Name of state
STABR	A2	180-181	Post Office abbreviation of state name
CITY	4A4	183-198	Name of largest city in ZIP region
		199-206	Reserved for future use
EXPREG	I3	207-209	Vehicle exposure region
ODOM	I7	210-216	Odometer reading
DRIVE	A1	218-218	Front, Rear, or 4 wheel drive
ECS	I2	220-221	Emission control system 0 (missing data)
AIRCON	A2	223-224	AC or NO air conditioning, otherwise blank
FEG	F6.2	225-230	55/45 MPG from cert data
FEE	F6.2	231-236	55/45 MPG from emission test
FECM	F6.2	237-242	City MPG as measured in-use
FEHM	F6.2	243-248	Hiway MPG as measured in-use
FEM	F6.2	249-254	Combined MPG as measured in-use
		256-276	Reserved for future use

MINUS.ONES is an editor command file that fills in missing values of certain FE influence variables with "typical" numbers so that FE influence GPM ratios (calculated later) take on a typical year-round or nationwide value if the raw data cannot pinpoint the time or place of the FE survey. Influences handled in this manner, and their fill-in values, are: Population density (4444), Month (13), Percent city driving (55), Miles per day (44), Temperature (55), State (US), Exposure region (25), and Odometer (6999). To provide an audit trail, actual occurrences of these fill-in values are first reset, as follows: Population density of 4444 becomes 4443, Percent city driving of 55 becomes 54, Miles per day of 44 becomes 45, Temperature of 55 becomes 56, and Odometer of 6999 becomes 7000; none of these resettings affects the respective influence index by more than 0.4% of its non-reset value. This is completely inconsequential compared to the basic accuracy of the influences (e.g. temperature figures are 30-year averages).

PATCH is a FORTRAN program that fills in missing in-use MPG data, and writes in wind speed values, in an SSFID-format data file.

Six types of in-use MPG data are accomodated by the SSFID format:

Perceived MPG:	City Highway Overall
Measured MPG:	City Highway Overall

It happens that most FE survey data files rarely have all 3 fields filled in each of the two groups. Given any one or two of the three perceived MPG values, PATCH estimates the missing values by taking the available MPG values, the EPA highway-to-city MPG ratio, and the survey city fraction to compute the missing MPG values. PATCH fills in missing measured MPG values similarly.

The wind speed function of PATCH is an XFORM-type augmentor; it uses the "month" and "exposure region" parameters in each data record to look up a wind speed value and write it into that record.

PATCH also calculates EPA 55/45 MPG from the EPA City and Highway figures.

PATCH is non-interactive (can be batched), and looks for its input in file "-INPUT" and writes its output to file "-PATCHED". It also outputs, as file "-ERR", an error-message list which indicates which lines of the data file were not patched with MPG values due to insufficient data, and which lines were not patched with wind speed values due to missing months or exposure regions.

Files for Cleaning and Coding SSFID Data

FWDnn files are lists of editor commands for coding front wheel drive/rear wheel drive vehicles on the basis of model name, or -- in the case where all of a given manufacturer's vehicles are FWD — manufacturer code number. The files overwrite blanks and coding errors. The files are model year specific, with the "nn" part of each file's name denoting the model year, e.g. FWD78.

To use the FWD files, all records for a given model year must be extracted from a data file and that model year group edited. The edited files must, of course, be reaggregated if multi-year data bases are to be kept together.

FIJnn files are lists of editor commands for coding data file records as to carburetion, fuel injection, or Diesel. With respect to fuel injection, they operate in exactly the same way as the FWD files. Turbocharging descriptors are preserved. Diesel coding assumes the "standard" field (FLDD, etc.) to be accurate. Blanks or miscodes which are carbureted (known not to be FI or Diesel) are overwritten with a "7", which is easily recognizable as something other than the number of barrels.

Use of the FIJ files, as with FWD's, requires isolation of model year specific data, then editing, followed by reaggregation.

TRANS is a small edit command file which recodes all lockups as automatics, and all duals, shift-automatics and creepers as manuals. It is applicable to all model years and mixes of them.

SEDWAG codes each data record which has "WAG", "SW", or "STAW" in its model name field as a "W", and each which does not as an "S" (sedan). Mercedes, Volvo, and GM wagons such as 300TDs, 245s, and Safaris are also handled.

Files for Influence Indexing and Analysis Formating

LANDFORM is an edit command file that assigns GPM ratios for the effect of landform on in-use fuel consumption, based on each record's topological code. It overwrites in the SSFID field that identifies the fully-spelled State name for each record, so it should only be used on a temporary copy of the subject data file.

ST.SPD uses the editor to assign highway speed GPM ratios based on the State code for each SSFID data record. It too, overwrites an alphabetic field, and should be used on a temporary data file copy.

ST.RCN writes State-specific GPM ratios for road condition into an SSFID file, via the editor. Separate GPM ratios are written for urban and non-urban driving. The pairs of ratios are overwritten in an alphabetic field.

SSF.READ is a command file that reads certain SSFID variables into MIDAS after all of the above operations have been performed. It cannot digest a raw SSFID file. Table III-13 is the format layout of the as-read data.

SSF.READ looks for its input in file "-COMBYR".

Table III-13

In-use Fuel Economy Data as read by SSF.READ

Variable	Format As Read	SSFID Columns	Field Description
1. ISCR	F2	1-2	Input data type (same as SSFID fmt)
2. MFR	F4	9-12	Manufacturer code
3. MY	F2	57-58	Model year
4. STD	A4	60-63	FLDV, etc.
5. MODEL1	A7	14-20	1st 7 char's of model name
6. MODEL2	A7	21-27	Next 7 char's of model name
7. CID	F4	39-42	Engine cu. in. displacement.
8. NCYL	F2	48-49	No. engine cylinders
9. DRIVE	A1	218	Front/Rear or 4wheel (F/R/4)
10. TRANS	A1	44	Auto or manu (A/M)
11. CARB	A1	52	Carb, FI, or Diesel (C/I/D)
12. BODY	A1	33	Sedan or wagon (S/W) ...or Pkup, Van or Jeep (P/V/J)
13. MONTH	F2	83-84	Month
14. STABR	A2	180-181	2-char. state abbrev.
15. ZIP	F3	65-67	3-digit ZIP code
16. FECG	F6.2	93-98	EPA City MPG
17. FEHG	F6.2	99-104	EPA Hiway MPG
18. FEG	F6.2	225-230	EPA 55/45 MPG
19. PCTURB	F3	86-88	Percent city driving
20. FECM	F6.2	237-242	Measured road MPG, city
21. FEHM	F6.2	243-248	Measured road MPG, hiway
22. FEM	F6.2	249-254	Measured road MPG, overall
23. ODOM	F7	210-216	Odometer miles
24. TEMP	F4	143-146	Avg. temp (deg f) for month
25. AMPD	1X,F3	90-92	Avg. miles per day
26. IPDEN	F6	76-81	Population density of ZIP
27. TOPO	A3	160-162	Topographic code
28. GRTOP	F5.3	166-170	Topographic GPM ratio
29. GRSPD	F5.3	183-187	Speeding GPM ratio
30. EXPREG	F2	208-209	Exposure region
31. WIND	F5.1	199-203	Wind mph for EXPOREG & month
32. GRRCC	F5.3	189-193	Road condition GPM ratio, city
33. GRRCH	F5.3	194-198	Road condition GPM ratio, hiway
34. IW	F5	34-38	Inertia weight
35. KLASS	F2	54-55	Vehicle size class code

IMPUTE is a multipurpose MIDAS command file. Operating on data read in via SSF.READ, it does the following:

a) Calculates GPM ratios for the fuel economy effects of temperature, miles per day, population density, odometer mileage, and wind, and aggregates these (and previously-assigned-and-read GPM ratios) into an imputed city GPM ratio and a highway GPM ratio;

b) Imputes road city MPG and road highway MPG using the above GPM ratios and the EPA City and Highway MPG values, and imputes an overall road MPG using these and the city driving fraction;

c) Calculates an influence index GPM ratio (which is thus the signature of the vector of FE influences) using the result of b) and the EPA 55/45 MPG value;

d) Calculates actual EPA-to-road GPM ratios.

VERB.WRITE outputs a 48-variable, 236-column (verbose) file with the results of IMPUTE included. This file has all of the variables deemed usable for data analysis. The verbose file layout is given in Table III-14.

The written output is file"-VERB".

TERS.WRITE outputs a 22-variable, 94-column (terse) file of the key variables necessary for data analysis. It is expected that most analysis can be done with such terse files. Table III-15 is the terse file layout.

The written output is file "-TERS"

VERB.TERS is a utility command file which reads a verbose file and writes out a terse version of it.

VERB.TERS reads file "-VERB" and writes its output into file "-TERSED".

This file simply reads and writes data as alphanumeric fields; the data as read are, therefore, not suitable for doing math in MIDAS.

PRE-NALY is a simple edit command file that re-codes the carburetion character in the vehicle technology field of a verbose or terse file as a "C", and places a "1." in the "number of observations" field.

Model Type Collapse Software

The CLAP programs are FORTRAN programs which collapse individual-vehicle records in analysis files into model type averages. They treat each variable in the line set being collapsed in one of three ways:

(a) Descriptor variables - These are common to all records in the set being collapsed, and are not mathematically manipulated, but simply carried along. Descriptor variables include manufacturer code, emission standard, model name, engine CID, no. cylinders, and technology code;

(b) Averageable variables - These include MPG values (averaged harmonically) and other numerics which are averaged arithmetically. The latter group includes FE influences (city fraction, odometer, temperature, miles per day, population density, and wind MPH), their respective GPM ratios, and inertia weight;

(c) Counted variables - These are categorical variables, either alphabetic or numeric. The number of categorical levels in the set being collapsed is counted. These include data source, model year, number of observations, month, state, ZIP, landform code, exposure region, and vehicle size class.

Table III-14

Verbose Analysis File Format

Variable	Format	Columns	Field Description
1. SORC	F3.0 (a)	1-3	Data source (20=Chrysler, 30=Ford, etc)
2. MANF	F4.0	4-7	Manufacturer code
3. MDLY	F3.0 (b)	8-10	Model year
4. ESTD	A4	11-14	FLDV, etc
5. NAM1	1X,A7	15-22	1st 7 char's of model name
6. NAM2	A7	23-29	Next 7 char's of model name
7. ECID	1X,F4.0	30-34	Engine cu. in. displacement
8. ECYL	F3.0	35-37	No. engine cylinders
#9. DVTYP	A1	38	Drive type (Front/Rear)
#10. TRTYP	A1	39	Transmission type (Auto/Manu)
#11. INTYP	A1	40	Induction type (Carb/FI/Dsl)
#12. BOTYP	A1	41	Body type (Sedan/Wagon)
13. NOBS	F6.0	42-47	No. of observations in record
14. MNTH	F3.0 (c)	48-50	Month
15. STAT	2X,A2 (d)	51-54	2-char. state abbrev.
16. ZIPC	1X,F4.0 (e)	55-59	3-digit ZIP code
17. EPAC	F5.1	60-64	EPA City MPG
18. EPAH	F5.1	65-69	EPA Hiway MPG
19. EPA	F5.1	70-74	EPA 55/45 MPG
20. CTYF	F5.0	75-79	Percent city driving
21. ECGR	F6.3	80-85	Imputed city influence index
22. EHGR	F6.3	86-91	Imputed hiway influence index
23. EOGR	F6.3	92-97	Imputed overall influence index
24. ROADC	F5.1	98-102	Measured road MPG, city
25. ROADH	F5.1	103-107	Measured road MPG, hiway
26. ROAD	F5.1	108-112	Measured overall road MPG
27. ACGR	F6.3	113-118	Actual city GPM ratio (EPAC/ROAD)
28. AHGR	F6.3	119-124	Actual hiway GPM ratio (EPAH/ROAD)
29. AOGR	F6.3	125-130	Actual GPM ratio (EPA/ROAD)
30. ODO	F7.0	131-137	Odometer mileage
31. ODOG	F6.3	138-143	Odom. GPM ratio
32. TEM	F4.0	144-147	Avg. temp (deg F) for month & ZIP
33. TEMG	F6.3	148-153	Temp. GPM ratio
34. MPD	F5.0	154-158	Avg. miles per day
35. MPDG	F6.3	159-164	AMPD GPM ratio
36. POD	F7.0	165-171	Population density of ZIP
37. PODG	F6.3	172-177	Popdens GPM ratio
38. TPO	1X,A3 (f)	178-181	Topographic code
39. TPOG	F6.3	182-187	Topo GPM ratio
40. SPDG	F6.3	188-193	Speeding GPM ratio
41. WND	F5.1	194-198	Wind mph
42. WNGC	F6.3	199-204	Wind GPM ratio, city
43. WNGH	F6.3	205-210	Wind GPM ratio, hiway
44. ROGC	F6.3	211-216	Road condition GPM ratio, city
45. ROGH	F6.3	217-222	Road condition GPM ratio, hiway
46. EXPO	1X,F3.0 (g)	223-226	Exposure region
47. IWGT	F6.0	227-232	Inertia weight
48. CLAS	F4.0 (h)	233-236	Vehicle size class code

(a) in a collapsed file, the number of sources; .....format remains F3.0
(b) in a collapsed file, the number of model years: format remains F3.0
(c) in a collapsed file, the number of months; ......format remains F3.0
(d) in a collapsed file, the number of states; .... **new format** 1X,F3.0
(e) in a collapsed file, the number of ZIPs; ....format remains 1X,F4.0
(f) in a collapsed file, the number of topo codes; **new format** 1X,F3.0
(g) in a collapsed file, the number of expo regions; format remains 1X,F3.0
(h) in a collapsed file, the number of classes; .....format remains F4.0

Table III-15

Terse Analysis File Format

Variable	Format	Columns	Field Description
1. SORC	F3.0	1-3	Data source (20=Chrysler, 30=Ford, etc)
2. MANF	F4.0	4-7	Manufacturer code
3. MDLY	F3.0	8-10	Model year
4. ESTD	A4	11-14	FLDV, etc
5. NAM1	1X,A7	15-22	1st 7 char's of model name
6. NAM2	A7	23-29	Next 7 char's of model name
7. ECID	1X,F4.0	30-34	Engine cu. in. displacement
8. ECYL	F3.0	35-37	No. engine cylinders
#9. DVTYP	A1	38	Drive type (Front/Rear)
#10. TRTYP	A1	39	Transmission type (Auto/Manu)
#11. INTYP	A1	40	Induction type (Carb/FI/Dsl)
#12. BOTYP	A1	41	Body type (Sedan/Wagon)
13. NOBS	F6.0	42-47	No. of observations in record
14. EPAC	F5.1	48-52	EPA City MPG
15. EPAH	F5.1	53-57	EPA Hiway MPG
16. EPA	F5.1	58-62	EPA 55/45 MPG
17. CTYF	F5.0	63-67	Percent city driving
18. EOGR	F6.3	68-73	Imputed overall influence index
19. ROAD	F5.1	74-78	Measured overall road MPG
20. AOGR	F6.3	79-84	Actual GPM ratio (EPA/ROAD)
21. IWGT	F6.0	85-90	Inertia weight
22. CLAS	F4.0	91-94	Vehicle size class code

The general form for CLAP program names is CLAP(X); The specific CLAP programs are described below. Each can process 20,000 data records.

CLAPTERS.1 collapses a terse input file into model type averages; it generates four output files. Output "-1" is a terse format file with the model type records from each data source (e.g. Ford surveys) and each model year disaggregated. Output file "-2" aggregates across all sources, with model years remaining disaggregated. Output "-3" aggregates across all model years, with sources remaining disaggregated. Output "-4" aggregates across both model year and data source.

CLAPVERB.1 collapses a verbose input file into four verbose outputs, with the same data source and model year aggregations as above.

CLAPTERS.2 collapses a terse input file into the same four aggregation schemes as above, but it generates two outputs at each of the four aggregation levels: a City file and a Highway file. The inclusion ranges of city fractions which define "city-driven" and "highway-driven" cars are specified in the RUN command, along with the input file assignment.

CLAPVERB.2 is the verbose-format version of CLAPTERS.2.

C. DATA SCREENING

A number of strategies can be used to decide whether data are "usable." Data usefulness criteria can be and have been applied to individual vehicles and indeed to entire data bases.

All of the data used in this investigation came to us pre-screened to some extent. Data received from DOE was pre-screened as follows.*

- Data from dynamometer tests (rather than on-road operation) were deleted;
- Data from road "tests" by organizations such as Motor Trend Magazine and Consumers Union were deleted;
- Data from consumer complaint letters were eliminated (not to discount them as invalid data, but simply because they capture only one tail of the distribution of in-use fuel economy);
- Vehicles with less than 2,000 odometer miles were eliminated;
- Vehicles from model years 1975 and 1976 were eliminated if they did not have Diesel, fuel injected, or four-cylinder engine, manual transmission, front wheel drive, or a combined EPA fuel economy of 25 MPG or greater;
- Outliers were eliminated; the outlier limits were 50% and 150% of a vehicle's combined EPA MPG rating, i.e., vehicles were eliminated which achieved less than half the EPA combined number or more than one and a half times the EPA combined number.

---

* Development of Adjustment Factors For On-Road Fuel Economy, prepared by Energy and Environmental Analysis, Inc. EPA 460/3-81-003, March, 1981.

Data pre-screening used by GM* was as follows:

- Vehicles with initial odometer readings less than 100 miles or greater than 20,000 were eliminated;
- Vehicles with less than 200 miles traveled between initial and final fillups were deleted;
- Vehicles with undeterminable EPA rating (e.g., unavailable engine/car line/transmission type) were eliminated;
- Outliers were eliminated using the same 50% and 150% outlier limits as the DOE data screening.

Data from the other sources (Ford, Chrysler, and EPA-Emission Factors) were pre-screened using protocols generally similar to the GM data.

Our own screening of the data as received from the various sources was done in two stages: "data source characterization", and "adjustment factor development". First-stage screening is discussed next; second-stage screening will be addressed after the Data Source Characterization section.

First-Stage Screening

In the first stage, only two criteria were used to eliminate data: undeterminable EPA rating, and outlier limits.

Vehicles with undeterminable EPA ratings generally had either unavailable car line/drive train combinations or obvious key punch/typographical errors. Where correctible typo errors** occurred in vehicle technologies that were relatively underpopulated, they were corrected. Most of these errors occurred in the Rear drive-Automatic-Carbureted category, however, and with the huge preponderance of data in that category, we were quick to throw out RAC data with even miniscule typographical errors* -- it simply was not needed, and was deemed not worth the trouble of respelling. Approximately 5% of the data (mostly RAC technology) was discarded by use of this criterion.

---

* SAE Paper 810384 In-Use Fuel Economy of 1980 Passenger Cars by R.W. Schneider, B.W. Lipka, and F.K. Miller, February, 1981.

** e.g., Ford 117 CID 6-cylinder engine ...must have been 171 CID.

The outlier screening procedure used the influence index concept (see Appendix A) to derive minimum and maximum limits. This was done by selecting very favorable and very unfavorable values of the influences for which GPM algorithms had been developed, and calculating the total influence index resulting from these influences occurring simultaneously. Table III-16 give the influence values selected, their individual GPM ratios, and the resultant total influence indexes. This suggests that MPG factors of 25% and 167% might not be impossible to encounter — unlikely, perphaps, but not impossible. Note that for a "typical" car with an EPA highway-to-city MPG ratio of 1.5, achieving 25% of its combined MPG figure is equivalent to achieving about 30% of its EPA City number; one which get 167% of its combined MPG is exceeding its EPA Highway figure by about 30%.

Naturally, it can always be argued that even worse, or better, conditions could stack up to yield even wider outlier limits ...in the end, it still comes down to a judgment call. Our judgment call is that "enough is enough" at values of 25% and 167%. Hence these were the limits used to purge outliers. Less than 1% of the data were deleted using these limits. Some data deleted were — in our judgment — clearly erroneous, such as a 73 MPG Impala V-8 and a 3 MPG 4-cylinder Horizon.

---

* e.g., Pontiac Catalena instead of Pontiac Catalina.

Table III-16

FE Influences used for Outlier Limits*

Influence	"Worst FE" Case: Value	GPM Ratio	"Best FE" Case: Value	GPM Ratio
Temperature	0°F	1.282	90°F	0.877 (No Air Cond)
Wind	20 MPH	1.030 (city)	0	1.000
Topography	D6	1.560	"Smooth"	1.000
Population Density	33,000	1.024	N/A	1.000
Road Condition	"Poor"	1.210	"Good"	1.012
Odometer	10	1.500	25,000	0.939
City Fraction	100%	1.148	0%	0.820
Miles per Day	1	2.083	100	0.889
			41	1.000
Total Influence		3.837	@100 mi/day @41 mi/day	0.537 0.648
GPM Ratio Values selected for outlier limits		4.0		0.60
% of EPA Comb. MPG		25		167

---

* See Appendix A.

IV. ANALYSIS

A. DATA SOURCE CHARACTERIZATION

A number of standard analyses were performed on each data source using canned software packages. These included:

- a. Overall data source road offset
- b. Overall data source road offset, by model year
- c. Constant road factors, by technology
- d. Constant road factors, by technology and model year
- e. MPG-dependent road factors, by technology
- f. MPG-dependent road factors, by technology and model year.

For those data sources with enough information to permit computation of fuel economy influence indexes, that metric was also analyzed along with actual road offset.

This section presents the results of analyses a, c, and e, and the influence index analysis. The other analyses are collected in Appendix B.

Chrysler Corporation

Table IV-1 is the overall road offset analysis for the Chrysler data. It shows an overall in-use fuel economy shortfall of 14.6%.

Table IV-2 is the constant-factor analysis of the Chrysler data by vehicle technology. Statistical significance tests for each technology's GPM ratio and influence index are included; these tests indicate the confidence level at which each technology's mean GPM ratio and influence index can be said to

Table IV-1

Overall Road MPG Offset for Chrysler - Measured MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	24.9	21.2	Average	1.171	(From GPM Ratio)	0.854
Standard Deviation	4.6	5.1	Standard Deviation	0.170		

Table IV-2

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : Chrysler (Measured MPG), 1981

Vehicle Technol	Number of Veh	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diffe	Influ Index	Influ Signf Diffe
		Min	HMAV	Max	Min	HMAV	Max				
R:A:C	430	19	19.9	23	9	16.6	28	1.205	100%	1.162	36%
R:A:I	3	19	19.3	19	17	18.4	21	1.053	82%	1.178	27%
R:M:C	1	24	23.5	24	25	25.0	25	.941	---	1.138	---
F:A:C	579	26	27.3	29	13	23.5	36	1.166	47%	1.181	100%
F:M:C	269	29	31.6	37	20	27.9	38	1.130	100%	1.102	100%

be different from the overall data source mean GPMR and influence index, respectively. For example, it is concluded at very high confidence that the RAC stratum's GPMR of 1.205 is different from the overall source GPMR of 1.171 (from Table IV-1); the RAC stratum's influence index of 1.162 is not statistically different from the overall source influence index of 1.158.

Table IV-3 (next page) details the MPG regression analyses for each of Chrysler's technology strata. This table gives the MPG-dependence algorithm and its correlation coefficient and standard error. The GPM ratio solutions to each algorithm at the minimum and maximum EPA MPG values are also given; these values can be used to plot the algorithms in analysis space. The actual range of GPMRs is, of course, wider than the range represented by the calculated endpoint solutions of the algorithms.

MPG dependence is undeterminable in two of the strata, RAI and RMC; for the former because there is only one EPA MPG value for the set, and for the latter because there is insufficient data for regression.

The algorithm solutions for the three regressible strata are interpreted in terms of road MPG in Table IV-4:

Table IV-4
Road MPG for Algorithms in Table IV-3

	Minimum EPA MPG			Maximum EPA MPG		
Technology	EPA	GPMR	Road	EPA	GPMR	Road
RAC	19/1.25 =		15.2	23/1.11 =		20.7
FAC	26/1.10 =		23.6	29/1.24 =		23.4
FMC	29/1.12 =		25.9	37/1.15 =		32.2

Table IV-3

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : Chrysler (Measured MPG), 1981

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG				Actual GPMR Range
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.808 - .0303(E)	.067	.192	1.25	19	1.11	23	.719 - 2.267
R:A:I	DATASET NOT REGRESSIBLE				19		19	.944 - 1.145
R:M:C	DATASET NOT REGRESSIBLE				24		24	.941 - .941
F:A:C	GPMR = -.241 + .0515(E)	.375	.151	1.10	26	1.24	29	.776 - 2.150
F:M:C	GPMR = .990 + .0044(E)	.051	.132	1.12	29	1.15	37	.820 - 1.636

For RAC vehicles, GPMR decreases with EPA MPG, implying that at EPA = 19, road MPG = 15.2, and at EPA = 23, road MPG = 20.7.

For FAC vehicles, GPM ratio increases with EPA MPG at such a rate that calculated road MPG is essentially constant over the relatively narrow EPA MPG range. This is a good example of the marginal usefulness of MPG-dependency regression analysis of a stratum with a narrow range of EPA MPG. For FMC vehicles, there is no significant change in calculated GPM ratio as a function of EPA MPG.

Other Data Sources

Tables IV-5 through IV-25 are the constant-factor and MPG-dependent analyses, by vehicle techology, for the other data sources. These will not be discussed individually.

This page intentionally
blank and un-numbered

Table IV-5

Overall Road MPG Offset for DOE-Fleet MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	19.0	15.7	Average	1.225	(From GPM Ratio)	0.817
Standard Deviation	2.8	3.2	Standard Deviation	0.242		

Table IV-6

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : DOE (Fleet MPG), All Years

		+++ EPA MPG +++			+++ Road MPG +++				
Vehicle Technol	Number of Veh	Min	HMAV	Max	Min	HMAV	Max	GPM Ratio	GPMR Signf Diffe
R:A:C	7977	12	19.0	30	5	15.6	42	1.225	93%
R:A:D	24	24	25.5	27	17	22.4	30	1.142	97%
R:M:C	10	17	18.2	26	12	14.8	21	1.242	34%
F:M:D	5	44	44.5	45	31	40.3	50	1.106	72%

Table IV-7

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : DOE (Fleet MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG				Actual GPMR Range
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .775 + .0232(E)	.259	.234	1.05	12	1.46	30	.604 - 3.514
R:A:D	GPMR = .593 + .0214(E)	.177	.162	1.11	24	1.17	27	.871 - 1.606
R:M:C	GPMR = .923 + .0170(E)	.442	.144	1.20	17	1.37	26	.957 - 1.477
F:M:D	GPMR = 2.481 - .0309(E)	.059	.239	1.13	44	1.09	45	.896 - 1.429

Table IV-8

Overall Road MPG Offset for DOE-Measured MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	20.8	17.6	Average	1.181	(From GPM Ratio)	0.847
Standard Deviation	6.0	6.5	Standard Deviation	0.136		

Table IV-9

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : DOE (Measured MPG), All Years

Vehicle Technol	Number of Veh	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diffe
		Min	HMAV	Max	Min	HMAV	Max		
R:A:C	317	13	19.5	30	11	16.4	26	1.193	94%
R:A:I	2	17	18.6	20	14	15.7	18	1.183	4%
R:A:D	24	22	24.7	27	16	22.5	30	1.098	96%
R:M:C	19	20	28.4	39	15	21.7	31	1.305	100%
R:M:D	4	27	27.7	29	24	26.2	29	1.056	93%
F:A:C	19	15	23.4	28	13	20.8	26	1.125	100%
F:A:D	1	24	24.0	24	22	22.0	22	1.090	---
F:M:C	3	29	32.2	39	21	25.3	29	1.274	74%
F:M:D	16	40	44.0	45	31	43.3	53	1.015	100%

Table IV-10

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : DOE (Measured MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG				Actual GPMR Range
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .994 + .0100(E)	.251	.116	1.12	13	1.29	30	.920 - 1.671
R:A:I	DATASET NOT REGRESSIBLE				17		20	1.120 - 1.247
R:A:D	GPMR = .148 + .0384(E)	.271	.176	.89	22	1.18	27	.808 - 1.550
R:M:C	GPMR = 1.581 - .0094(E)	.296	.158	1.39	20	1.22	39	1.103 - 1.694
R:M;D	GPMR = .842 + .0077(E)	.108	.106	1.05	27	1.07	29	.980 - 1.138
F:A:C	GPMR = 1.092 + .0014(E)	.063	.068	1.11	15	1.13	28	1.032 - 1.325
F:A:D	DATASET NOT REGRESSIBLE				24		24	1.090 - 1.090
F:M:C	GPMR = 1.180 + .0029(E)	.142	.145	1.26	29	1.29	39	1.156 - 1.351
F:M:D	GPMR = 3.883 - .0651(E)	.461	.155	1.29	40	.95	45	.845 - 1.408

Table IV-11

Overall Road MPG Offset for DOE-Perceived MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	26.1	24.0	Average	1.095	(From GPM Ratio)	0.913
Standard Deviation	7.4	8.1	Standard Deviation	0.295		

Table IV-12

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : DOE (Perceived MPG), All Years

Vehicle Technol	Number of Veh	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diffe	Influ Index	Influ Signf Diffe
		Min	HMAV	Max	Min	HMAV	Max				
R:A:I	49	14	16.5	21	10	14.9	25	1.101	30%	1.227	9%
R:A:D	108	22	24.6	28	12	20.9	37	1.180	100%	1.210	72%
R:M:I	47	14	20.6	23	16	20.7	32	.998	100%	1.208	55%
F:A:C	169	11	23.5	32	9	21.8	40	1.084	25%	1.283	99%
F:A:I	39	17	20.2	27	10	19.3	32	1.038	89%	1.275	57%
F:A:D	4	24	23.9	24	14	17.6	20	1.357	89%	1.234	4%
F:M:C	201	23	32.3	40	19	28.9	45	1.128	99%	1.202	90%
F:M:I	122	18	28.8	30	17	28.2	48	1.024	100%	1.225	17%
F:M:D	68	40	44.2	45	24	40.3	55	1.086	17%	1.202	71%

Table IV-13

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : DOE (Perceived MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG				Actual GPMR Range
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:I	GPMR = 1.456 - .0213(E)	.217	.188	1.16	14	1.00	21	.625 - 1.488
R:A:D	GPMR = .055 + .0456(E)	.279	.231	1.06	22	1.31	28	.674 - 2.238
R:M:I	GPMR = 1.029 - .0015(E)	.016	.144	1.01	14	.99	23	.671 - 1.245
F:A:C	GPMR = .967 + .0047(E)	.092	.232	1.02	11	1.12	32	.668 - 2.970
F:A:I	GPMR = 1.325 - .0138(E)	.246	.195	1.09	17	.96	27	.672 - 1.676
F:A:D	DATASET NOT REGRESSIBLE				24		24	1.196 - 1.709
F:M:C	GPMR = .417 + .0217(E)	.435	.173	.93	23	1.28	40	.785 - 1.863
F:M:I	GPMR = .947 + .0027(E)	.019	.204	.99	18	1.03	30	.608 - 1.646
F:M:D	GPMR = 4.321 - .0729(E)	.332	.204	1.42	40	1.06	45	.820 - 1.838

Table IV-14

Overall Road MPG Offset for EPA-Measured MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	22.2	18.2	Average	1.211	(From GPM Ratio)	0.826
Standard Deviation	6.1	6.5	Standard Deviation	0.185		

Table IV-15

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : EPA (Measured MPG), All Years

Vehicle Technol	Number of Veh	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diffe	Influ Index	Influ Signf Diffe
		Min	HMAV	Max	Min	HMAV	Max				
R:A:C	582	12	19.5	32	7	15.6	31	1.251	100%	1.105	53%
R:A:I	10	18	21.2	28	13	18.2	23	1.159	74%	1.107	8%
R:M:C	145	18	28.4	41	14	23.9	38	1.187	89%	1.095	29%
R:M:I	14	19	22.7	32	17	21.0	31	1.092	98%	.991	100%
F:A:C	98	13	25.2	32	11	21.3	31	1.184	83%	1.139	94%
F:A:I	23	16	19.0	27	11	15.8	26	1.192	44%	1.154	78%
F:M:C	112	24	32.1	42	18	28.9	50	1.121	100%	1.093	35%
F:M:I	27	27	29.5	33	19	28.9	38	1.022	100%	1.018	99%

Table IV-16

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : EPA (Measured MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	Actual GPMR Range
R:A:C	GPMR = 1.207 + .0022(E)	.042	.182	1.23	12	1.28	32	.805 - 1.972
R:A:I	GPMR = 1.274 - .0054(E)	.117	.142	1.18	18	1.12	28	1.000 - 1.463
R:M:C	GPMR = 1.157 + .0010(E)	.030	.173	1.18	18	1.20	41	.693 - 1.680
R:M:I	GPMR = .841 + .0108(E)	.276	.161	1.04	19	1.19	32	.868 - 1.311
F:A:C	GPMR = 1.161 + .0009(E)	.013	.186	1.17	13	1.19	32	.870 - 2.050
F:A:I	GPMR = 1.444 - .0128(E)	.373	.139	1.24	16	1.09	27	1.009 - 1.436
F:M:C	GPMR = .728 + .0120(E)	.341	.150	1.02	24	1.23	42	.645 - 1.604
F:M:I	GPMR = 1.127 - .0036(E)	.046	.146	1.03	27	1.01	33	.809 - 1.474

Table IV-17

Overall Road MPG Offset for EPA-Perceived MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	21.9	18.6	Average	1.191	(From GPM Ratio)	0.840
Standard Deviation	6.4	5.9	Standard Deviation	0.273		

Table IV-18

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : EPA (Perceived MPG), All Years

Vehicle Technol	Number of Veh	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diffe
		Min	HMAV	Max	Min	HMAV	Max		
R:A:C	322	13	18.8	29	8	16.1	31	1.175	83%
R:A:I	20	16	16.8	17	12	14.8	20	1.134	94%
R:A:D	1	24	24.3	24	28	27.7	28	.877	---
R:M:C	187	20	27.7	42	11	22.5	35	1.248	96%
R:M:I	25	20	21.3	26	16	20.2	27	1.061	100%
F:A:C	11	14	16.4	28	12	15.6	24	1.053	98%
F:A:I	1	28	28.1	28	29	29.3	29	.958	---
F:M:C	59	24	33.2	45	12	27.4	38	1.222	54%
F:M:I	9	28	28.6	30	22	26.7	32	1.071	95%

Table IV-19

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : EPA (Perceived MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	Actual GPMR Range
R:A:C	GPMR = 1.017 + .0081(E)	.168	.186	1.12	13	1.25	29	.717 - 1.869
R:A:I	GPMR = .747 + .0231(E)	.113	.127	1.11	16	1.14	17	.881 - 1.355
R:A:D	DATASET NOT REGRESSIBLE		.		24		24	.877 - .877
R:M:C	GPMR = .127 + .0397(E)	.403	.350	.91	20	1.79	42	.781 - 3.575
R:M:I	GPMR = .835 + .0105(E)	.294	.091	1.04	20	1.11	26	.919 - 1.303
F:A:C	GPMR = .906 + .0087(E)	.205	.173	1.02	14	1.15	28	.881 - 1.467
F:A:I	DATASET NOT REGRESSIBLE				28		28	.958 - .958
F:M:C	GPMR = .569 + .0194(E)	.239	.319	1.04	24	1.43	45	.768 - 2.829
F:M:I	GPMR = 4.489 - .1196(E)	.280	.158	1.12	28	.96	30	.915 - 1.325

Table IV-20

Overall Road MPG Offset for Ford-Measured MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	18.9	15.6	Average	1.214	(From GPM Ratio)	0.824
Standard Deviation	4.1	4.4	Standard Deviation	0.219		

Table IV-21

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : Ford (Measured MPG), All Years

		+++ EPA MPG +++			+++ Road MPG +++						
Vehicle Technol	Number of Veh	Min	HMAV	Max	Min	HMAV	Max	GPM Ratio	GPMR Signf Diffe	Influ Index	Influ Signf Diffe
R:A:C	25445	14	18.1	26	5	14.9	37	1.220	100%	1.191	67%
R:A:I	382	19	19.3	19	8	15.7	27	1.227	89%	1.188	15%
R:M:C	3550	18	24.0	29	8	20.1	34	1.197	100%	1.183	91%
F:M:C	890	29	32.5	38	11	29.7	56	1.103	100%	1.157	100%

Table IV-22

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : Ford (Measured MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	Actual GPMR Range
R:A:C	GPMR = 1.069 + .0081(E)	.107	.217	1.18	14	1.28	26	.602 - 3.781
R:A:I	GPMR = .266 + .0499(E)	.032	.210	1.20	19	1.23	19	.699 - 2.331
R:M:C	GPMR = .621 + .0237(E)	.302	.210	1.06	18	1.31	29	.693 - 3.550
F:M:C	GPMR = .389 + .0217(E)	.377	.190	1.02	29	1.22	38	.679 - 3.027

Table IV-23

Overall Road MPG Offset for GM-Measured MPG Data Source

Fuel Economy	EPA	Road	GPM Ratio		MPG Factor	
Harmonic Average	19.3	16.3	Average	1.187	(From GPM Ratio)	0.842
Standard Deviation	5.6	5.9	Standard Deviation	0.201		

Table IV-24

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis

Vehicle Technol	Number of Veh	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diffe	Influ Index	Influ Signf Diffe
		Min	HMAV	Max	Min	HMAV	Max				
R:A:C	7037	11	17.8	32	7	14.9	38	1.206	100%	1.165	97%
R:A:I	157	15	18.1	29	8	14.7	31	1.223	93%	1.180	53%
R:A:D	239	22	25.8	30	13	23.2	40	1.112	100%	1.093	100%
R:M:C	1151	14	25.4	42	9	22.3	59	1.146	100%	1.171	13%
R:M:I	120	19	26.1	32	14	23.9	49	1.094	100%	1.116	100%
R:M:D	23	30	30.8	31	24	29.6	35	1.043	100%	1.133	77%
F:A:C	891	10	19.4	32	6	16.3	37	1.199	82%	1.227	100%
F:A:I	91	17	18.8	28	9	15.9	30	1.170	63%	1.208	90%
F:A:D	66	25	25.2	26	16	20.8	32	1.210	66%	1.181	35%
F:M:C	449	24	30.1	41	16	28.4	46	1.064	100%	1.170	3%
F:M:I	78	21	28.6	32	17	27.4	37	1.044	100%	1.174	15%
F:M:D	55	32	40.6	47	24	38.1	49	1.067	100%	1.086	100%

Table IV-25

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : GM (Measured MPG), All Years

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	Actual GPMR Range
R:A:C	GPMR = 1.010 + .0106(E)	.186	.200	1.13	11	1.35	32	.641 - 2.409
R:A:I	GPMR = 1.565 - .0185(E)	.250	.221	1.29	15	1.03	29	.714 - 2.089
R:A:D	GPMR = 1.198 - .0033(E)	.038	.152	1.12	22	1.10	30	.731 - 1.828
R:M:C	GPMR = .942 + .0077(E)	.217	.186	1.05	14	1.27	42	.713 - 2.627
R:M:I	GPMR = .930 + .0061(E)	.167	.160	1.05	19	1.13	32	.667 - 1.622
R:M:D	GPMR = .465 + .0187(E)	.118	.111	1.02	30	1.05	31	.885 - 1.332
F:A:C	GPMR = 1.100 + .0046(E)	.134	.194	1.15	10	1.25	32	.678 - 2.021
F:A:I	GPMR = 1.426 - .0133(E)	.202	.210	1.20	17	1.05	28	.801 - 1.860
F:A:D	GPMR = 1.408 - .0078(E)	.035	.169	1.21	25	1.20	26	.828 - 1.586
F:M:C	GPMR = .777 + .0094(E)	.270	.146	1.00	24	1.16	41	.672 - 1.815
F:M:I	GPMR = .683 + .0126(E)	.238	.108	.95	21	1.08	32	.815 - 1.297
F:M:D	GPMR = 1.024 + .0011(E)	.048	.115	1.06	32	1.07	47	.835 - 1.357

B. CONSENSUS FINDINGS

1. There is a road MPG shortfall. All data sources agree that there is on the average, a road MPG shortfall relative to the EPA Combined figure. Furthermore, all sources are in general agreement on the magnitude of the shortfall except for the DOE-perceived MPG data source. (In this DOE data the shortfall is optimistic by a factor of nearly two; this may be due to the absence of high-shortfall RAC technology vehicles from this data set.) See Table IV-26.

2. Certain technologies have statistically different road MPG offsets compared to overall survey average offsets. Table IV-27 shows, for each technology, the number of data sources which yield road offsets statistically different for that technology from the overall source average offset.

   The sources are in general agreement that the RAC technology has uniquely high (worse) road offset, and the following technologies have uniquely low (better) road offsets:

   RAD, RMI, RMD,
   FMC, FMI, FMD

   Hence, as far as non-modal constant offset factors are concerned, one fleetwide (all-technologies) offset factor is statistically invalid; technology specificity must be considered.

3. For most vehicle technologies, road MPG offsets become worse for higher EPA MPG levels. MPG dependence of the technologies' GPM ratios is summarized in Table IV-28. For eight technologies, an increasing GPM ratio is evident in a majority of the sources' data.

   For two Diesel groups, FAD and FMD, negative slopes in the MPG dependance are found only in sources for which the EPA MPG range is narrow*, i.e., the MPG dependence regressions are not useful. The one FMD source with a reasonably wide MPG range, 32 to 45 MPG, does in fact show a small positive slope.

For two technologies, RAI and FAI, negative MPG dependence slopes are indicated. No data source shows positive slope for FAI vehicles; both sources which do give positive slopes for RAI vehicles have very narrow MPG ranges, leaving sources with negative slopes as the most reliable. The explanation for this behavior by these two technologies involves differentiation by engine size, and appears later.

---

* For FAD, 24 to 26 MPG; for FMD, 40 to 45 MPG.

Table IV-26

Overall Road MPG Offset for the Eight Data Sources

Survey	Overall MPG Slip	No. Vehicles
Chrysler, Measured MPG	-14.6%	1,282
DOE, Fleet	-18.3%	8,016
DOE, Measured MPG	-15.3%	405
DOE, Perceived MPG	- 8.7%	807
EPA, Measured MPG	-17.4%	1,011
EPA, Perceived MPG	-16.0%	635
Ford, Measured MPG	-17.6%	30,267
GM, Measured MPG	-15.8%	10,357
All Sources (Sample-weighted)	-17.1%	52,780

Table IV-27

Technologies* whose MPG offset is Significantly** Different from Overall Source Average Offset

Technology	Number of Occurences	Offset Higher (worse) or Lower (better) than average
RAC	5 of 7	High all 5
RAI	2 of 5	One high, one low
RAD	4 of 4	3 low, 1 high
RMC	4 of 6	2 low, 2 high
RMI	4 of 4	Low all 4
RMD	1 of 1	Low
FAC	2 of 6	Both low
FAI	None signif.	
FAD	None signif.	
FMC	5 of 6	4 low, 1 high
FMI	3 of 3	All low
FMD	2 of 3	Both low

---

* Number of vehicles greater than or equal to 10

** Significance greater than or equal to 90%

Table IV-28

MPG Dependency of Road Offset, by Technology

Technology	Number of Occurrences*:		Unweighted Average Slope, GPMR per MPG
	Increasing **	Decreasing	
RAC	6	1	0.005
RAI	2	3	0.006
RAD	3	1	0.026
RMC	5	1	0.014
RMI	3	1	0.007
RMD	1	0	0.019
FAC	6	0	0.012
FAI	0	3	-0.013
FAD	0	1	-0.008
FMC	6	0	0.015
FMI	2	1	0.004
FMD	1	2	-0.046

---

* Number of vehicles greater than or equal to 10.

** "Increasing" means road offset worsens for higher MPG ratings; "decreasing" means road offset lessens for higher MPG ratings.

C. SECOND STAGE SCREENING

Close scrutiny of the data base is necessary prior to use of the data to develop adjustment factors for future vehicles. The central question is "what past and present vehicles should be allowed to represent future vehicles?"

Vehicle/Engine Technology

A strict approach to this question might consider throwing out cars on the basis of the demise or expected demise of all sorts of technical parameters, such as non-electronic feedback control, longitudinally mounted front-drive engines, etc. We have chosen a liberal approach, retaining all technologies in the data base except for engines with displacements of 400 cubic inches or more. Engines that large have not been used in new passenger cars since model year 1979, with the single exception of Rolls-Royce cars*, which continue to be available.

Emission Control

The on-road FE data have not been coded as to emission control system type, so a direct measure of the dependence of road FE offset upon emission system is not yet possible. However, data from dynamometer tests conducted in the FY1980 Emission Factors Program** has been reviewed for possible insight into emission system effects. Table IV-29 summarizes the relationships between City dyno test MPG and EPA Guide (City) MPG, expressed as MPG ratios, as a function of catalyst type and Carbon Monoxide emission standard.

This table suggests that tighter emissions standards or higher technology emission controls might correspond to greater MPG slip, as measured by dynamometer tests. However, the vehicles were not stratified by odometer mileage or AMPD, so it cannot be said if the apparent trend is a real one.

---

* There are no Rolls-Royces in the in-use FE data base.

** Kearis, Final Monthly Report on In-Use Vehicle Test Programs Conducted During the 1980 EFP, Memo to Director, Emission Control Technology Division, December 2, 1981.

Table IV-29

Dyno Test MPG Offset, by Catalyst type
and Stringency of Emission Standard
(Low Altitude Test Sites)

Catalyst Type	CO = 15 gm/mi[(a)]		CO = 7-9 gm/mi[(b)]		CO = 3.4 gm/mi[(c)]	
	Number	FTP/Guide	Number	FTP/Guide	Number	FTP/Guide
None	9	0.95	11	0.97	-	-
Ox[(d)]	36	0.94	119	0.93	27	0.88
3 way[(e)]	-	-	136	0.95	10	0.89
Ox + 3 way	-	-	99	0.91	47	0.89

(a) 49-states, 1978-1979

(b) 1980 49-states (7); 1981 waivered 49-states (7);
1980 Calif (9); 1981 Calif (7)

(c) 1981 49-states

(d) Ox = Oxidation

(e) 3 way = Oxidation and Reduction

No vehicles have been eliminated from the on-road fuel economy data base as a result of this inquiry.

Model Year Differences

The question of on-road MPG offset as a function of model year is important. If there is a trend in the offset with model year, that trend certainly would have to be accounted for * in developing adjustment factors for future model years. If vehicles of certain model years perform in a manner uncharacteristic of what is expected of future vehicles, it can be argued that those unrepresentative vehicles should be excluded from adjustment factor development.

Model year effects were examined using model-type average ("collapsed") data, to improve the distribution among manufacturers and technologies inherent in the raw, diffuse data. The three distinct data types: consumer-measured MPG, consumer-perceived MPG, and fleet data, were kept separate so that their respective trends could be determined.

Table IV-30 shows the model year trend in average fuel consumption ratio, EPA MPG, Road MPG, and in-use MPG shortfall for the three data types. With the exception of model year 1977**, the average EPA MPG for the consumer-measured data set is quite close to published fleet average EPA fuel economy figures. This suggests that the consumer-measured data is a representative sample of the entire in-use fleet, at least as far as its EPA MPG characteristic. The time series of fuel economy offsets for the consumer-measured data is disjoint, showing a rise-fall-rise pattern.

The perceived-MPG data obviously reflect a biased sample of higher-MPG cars; this was expected, due to retention of only higher-technology cars from the DOE perceived data source. The FE offset time series here is again disjoint, but does not parallel that of the consumer-measured data.

---

* e.g., by extrapolating the trend.

** A relatively small sample, only 37 model types.

Table IV-30

Model Year Trend in In-Use MPG and EPA MPG

	Model Year: 1975	1976	1977	1978	1979	1980	1981
Avg. EPA MPG*	15.8	17.5	18.3	19.9	20.1	22.4	25.0
Consumer Data, Measured MPG (43,322 cars)							
GPM Ratio	1.13	1.21	1.25	1.22	1.16	1.18	1.20
Avg. EPA MPG	15.8	17.7	19.8	19.5	20.2	22.8	24.8
Avg. Road MPG	13.9	14.6	15.9	16.0	17.4	19.2	20.6
MPG Shortfall	12%	18%	20%	18%	14%	16%	17%
Consumer Data, Perceived MPG (1442 cars)							
GPM Ratio	-	1.18	1.20	1.06	1.13	-	-
Avg. EPA MPG	-	24.9	20.2	26.4	24.9	-	-
Avg. Road MPG	-	21.2	17.1	25.2	21.9	-	-
MPG Shortfall	-	15%	15%	4%	12%	-	-
Fleet Data (8016 cars)							
GPM Ratio	-	1.95	1.23	1.26	1.15	1.04	-
Avg. EPA MPG	-	25.8	18.2	20.1	18.5	21.6	-
Avg. Road MPG	-	13.7	14.9	16.0	16.1	20.7	-
MPG Shortfall	-	47%	18%	21%	13%	4%	-

---

* From SAE Paper 810386, Light Duty Automotive Fuel Economy...Trends through 1981 by J.A. Foster, J.D. Murrell, and S.L. Loos, February 1981.

The fleet data for 1976 are atypical (on the high-MPG side) due to the prescreening of the DOE data. The 1977-1980 fleet cars, however, do have average EPA values that agree reasonably well with average fleet EPA fuel economy figures for those model years. For the fleet data, a trend of general improvement is seen in the road offset.

There is no consensus between the three data types as to a model year trend in the road MPG offset. Stated differently, the perceived-MPG data and the fleet data fail to replicate the model year trend of the consumer-measured MPG data.

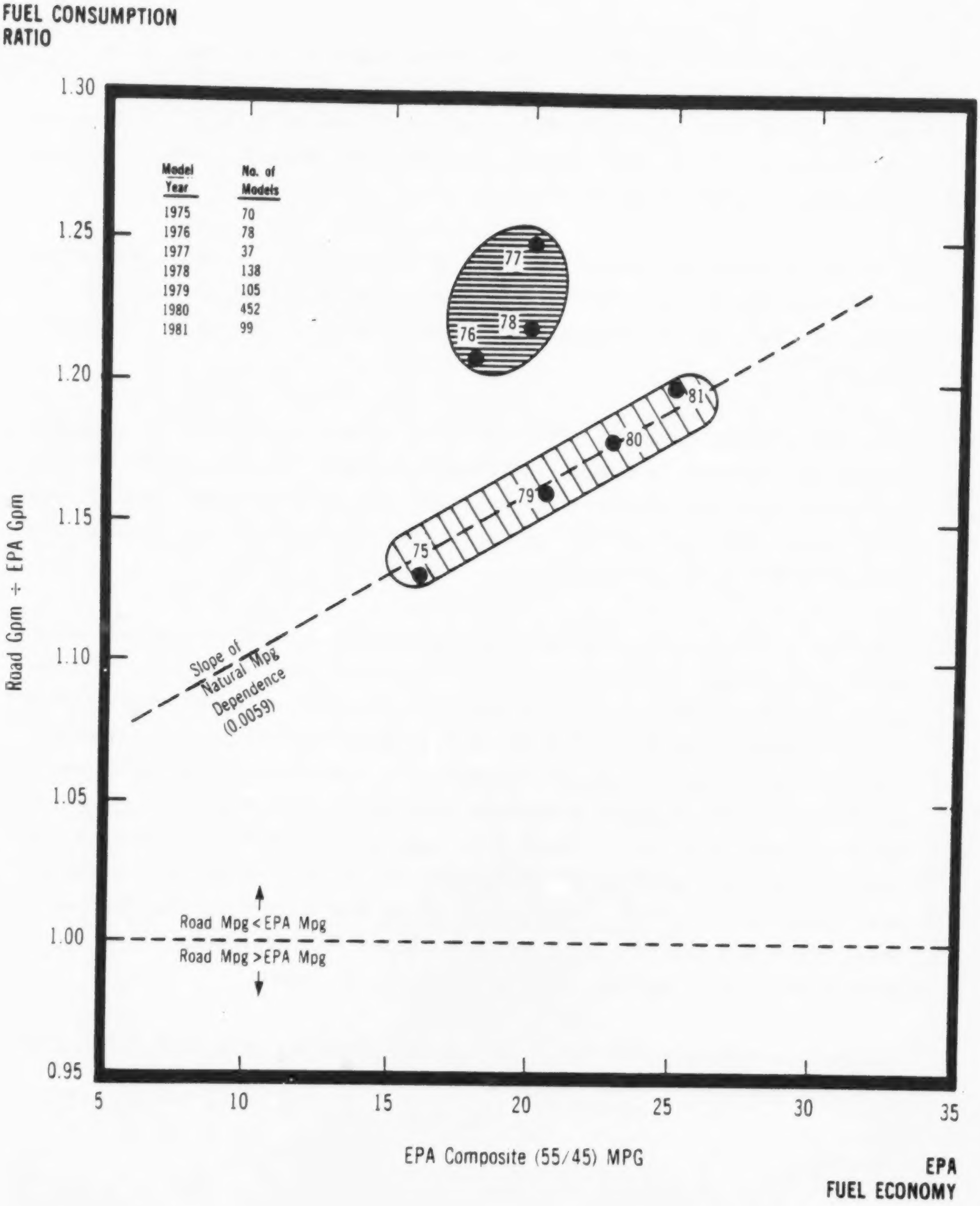
When the consumer-measured MPG model year trend is plotted in analysis space, its disjoint behavior immediately becomes understandable. Figure IV-1 shows that the consumer data fall into two distinct model year groups: model years 1975 and 1979-81 belong to one population*, and model years 1976-78 form a different population.

There is a fundamental difference between these two model-year groups which makes this finding no surprise at all -- the only surprise is that it shows up so clearly: certain aspects of the 1975 EPA test procedure were allowed to relax significantly in 1976-78, most notably test weight classification and shift schedules for manual transmissions. In these three model years, manufacturers were allowed a certain latitude to "optimize testing procedures for favorable fuel economy test results". In 1979, a return to the rigor of the 1975 procedures was enforced in recognition of the "optimization" that was occurring. The higher in-use MPG offsets of the "optimization" years show that MPG gains achieved in the EPA tests during those years were paper gains - they did not materialize on the road.

Figure IV-2 indicates that the fleet and perceived-MPG data show trends with time that disagree with the measured data and with each other.

---

* The "natural MPG dependence" on Figure IV-1 is explained in the next Section.



Figure

IV—1

Model Year Trend in Fuel Economy Offset: Consumer Measured Mpg Data

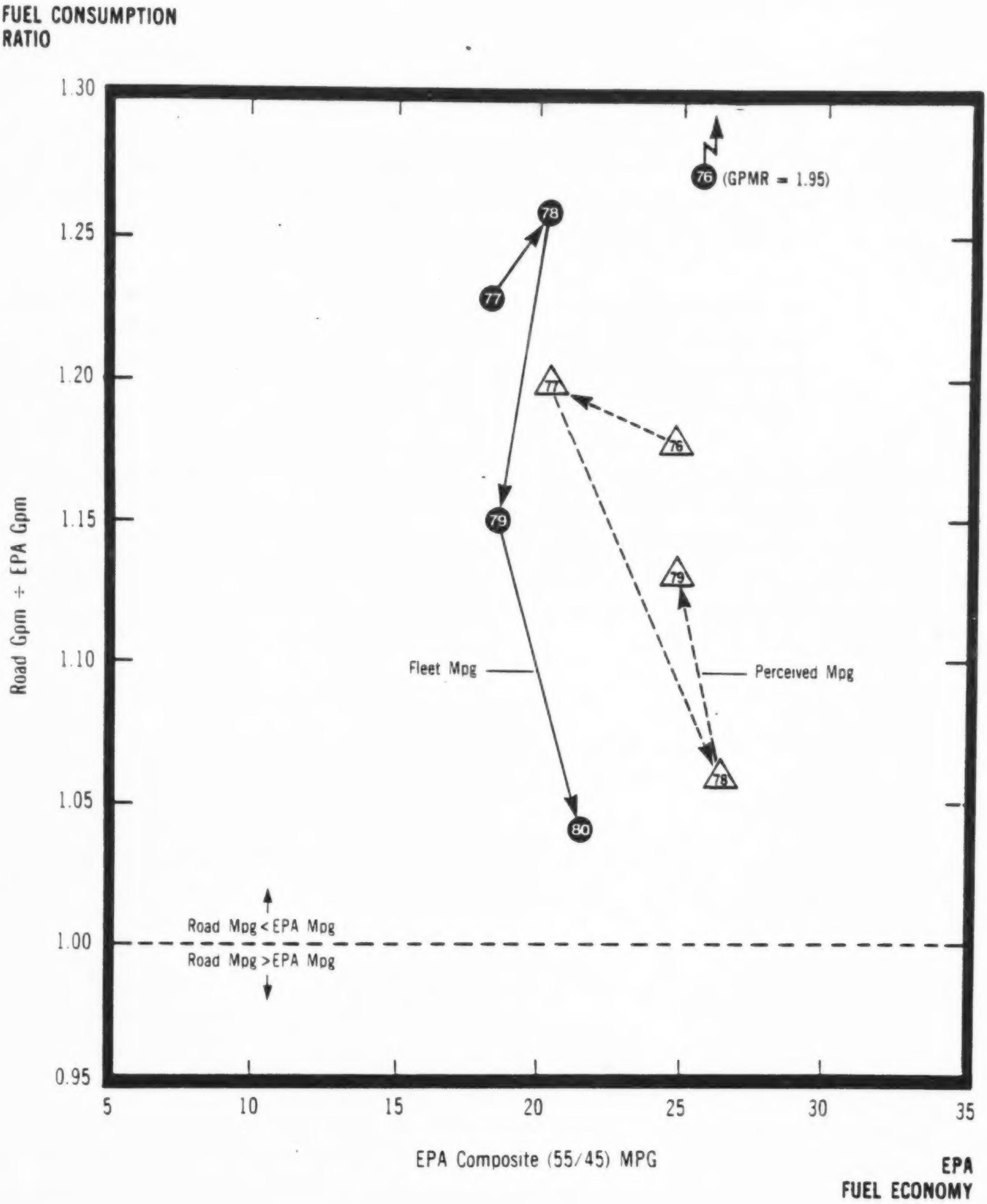


Figure
IV–2

Model Year Trends in Fuel Economy Offset: Perceived-Mpg and Fleet Data

At this point, two things are clear:

- the decision to retain data from model years 1976 through 1978 depends entirely on the question of the degree to which the rigor of the 1975 test is going to be maintained into the mid-80's; and
- the random and inconsistent behavior of perceived-MPG and fleet data with respect to the model year trend raises a question as to the advisability of using these two data types to develop in-use adjustment factors appliable to consumer driving.

Future Relaxation or enforcement of 1975 Test Rigor - Future relaxation of test stringency can be estimated roughly by considering the history of exceptions to the 1975 manual transmission shift specifications, shown in Table IV-31. (This is only one of several test items whose stringency has a quantifiable time trend; it is shown here as an illustration of a typical time trend.)

Table IV-31
Trend in Usage of Alternate Shift Schedules
(Percent of all Manual Trans. Tests)

	1976	1977	1978	1979	1980	1981	1982
Domestic	43	49	62	45	59	71	75
European	6	28	44	53	49	66	88
Japanese	27	54	88	66	33	57	46
Total	28	44	64	54	48	65	68

This table shows that the fractional usage of alternate shift schedules grew significantly through 1978, dropped slightly in 1979 and 1980, but has resumed its increase in the past two model years. The quantity of alternate shift usage is only part of the story, however; the relative MPG gains achieved by alternate shifting schedules are believed to be less significant in the more recent model years. It is to be noted, though, that all alternate shift schedules are used for fuel economy benefit: we know of no instance in which a manufacturer has requested alternate shifting in order to decrease test MPG from what it would have been using the 1975 specifications.

It is also worth noting that alternate shifting is the only aspect of testing in which the manufacturers have requested that test procedures be modified to reflect real-world conditions. So far there have been no requests for better test simulation of real world temperatures, road surfaces, accessories operation, tire pressures, or other conditions not favorable to fuel economy.

Conclusion on model year data usage - It is abundantly clear from the above discussion that data from model years 1976 through 1978, which reflect a degree of relaxation from 1975 test rigor, are appropriate for use in adjustment factor development.

Our decision, then, is to keep all model year data, 1975-1981. This data retention decision is tantamount to assuming that relaxation of test rigor will be equivalent to having some 28% of the mid 1980's fleet be represented by excess road fuel consumption similar to the 1976-1978 cars.

Perceived-MPG Data and Fleet Data

These two types of data were compared in detail against measured-MPG data for consumer vehicle operation. Appendix C contains the complete analysis.

It is concluded from that analysis that perceived-MPG data and fleet data disagree with measured MPG data more often than they agree. It is also concluded that inclusion of perceived-MPG or fleet data which do agree with the measured data would not change the conclusions reached by using measured consumer data alone, and therefore only measured-MPG consumer data are appropriate for in-use adjustment factor development.

D. ADJUSTMENT ALGORITHM DEVELOPMENT...NON-MODAL

Model Type Averaging

The EPA has never claimed that its label values equal the fuel economies of individual consumer vehicles; the label values have always been recognized as some sort of "model type" averages*. This in itself is reason enough to consider using model type averaged data to develop road adjustment factors for use in labeling. Other benefits do accrue from the use of model type data, however: the relative apportionment of model type data among manufacturers and among technologies improves, and of course the sheer size of the data base shrinks to a much more manageable level.

The consumer-driven, measured-MPG data were collapsed into model type averages as follows.

1. Discrepancies in car line naming conventions among the various data sources were eliminated.

2. All data records for a given model year and model type (MYMT) were collapsed into one record for each data source, with each data field containing the average value for all samples within that source.

3. The individual data source collapsed records for each MYMT were then aggregated into single master MYMT records with all data fields containing sample-weighted average values. When thus aggregating across data sources, records with sample sizes below a value of 30 were weighted according to their actual size; sources with larger sample sizes were weighted at the value of 30. This was done to prevent source records representing, say, 20 or 25 cars from being completely swamped by sources which happened to survey hundreds of that same model.

---

* The 1974 Gas Mileage Guide included individual vehicles' test results, to one decimal, but since 1975 the Guide has been based on model type averaging quite intentionally. The 1975 Guide even averaged across transmission types, a practice which was discontinued in 1976.

The above process collapsed 43,322 data records down to 1,483 MYMT records. Even after aggregating across data sources, however, there were still 413 MYMTs represented by only one vehicle. These were not used. An additional 91 MYMTs, involving engines of 400 CID or greater, were also not used. Thus, there were 979 data records left.

Table IV-32 compares the model year, manufacturer, and vehicle technology distributions of the diffuse data and the model type data.

All of the model type data are listed in Appendix E.

Analysis

The constant-factor analysis for the consumer-measured MPG model type data appears in Table IV-33. Relative to this data set's weighted average GPMR of 1.182,

- RAC vehicles have statistically worse road FE offset (higher GPMR);
- All front drive automatics (FAC, FAI, FAD) are indistinguishable; and
- All other technologies have statistically better road FE offsets (lower GPMR).

A number of superficial conclusions could be drawn from the constant-factor analysis. Ignoring the statistically significant technology differences in FE offset, and taking only the inverse of the data set average GPMR, an MPG adjustment factor of 1/1.182 = 0.846 would be indicated. Ignoring the sample weighting, the simple average of the twelve technologies' GPMRs is 1.122, and the inverse of this would suggest an MPG adjustment factor of 0.891. Using our projected mid-80's sales weighting for the 12 technologies, a weighted average GPMR of 1.149 would be calculated, giving an MPG adjustment factor of 0.871. For any of these jumps to simple conclusions, there are individual technologies with average GPMR in error by more than 9 percent.

Table IV-32

Comparison between Diffuse Data and Model Type Data

Distribution by Model Year:	1975, 1979-81	1976-78
Diffuse Data	66.1%	33.9%
Model Type Data	74.2%	25.8%

Distribution by Manufacturer:	GM	Ford	Chrys	AMC	Europ	Japan
Diffuse	19.6%	72.5%	5.0%	0.2%	1.7%	1.0%
Model Type	44.8%	26.3%	12.0%	1.0%	10.1%	5.8%

Distribution by Technology:	RAC	RAI	RAD	RMC	RMI	RMD
Diffuse	78.0%	1.3%	0.6%	11.2%	0.3%	0.1%
Model Type	58.5%	2.0%	2.8%	18.1%	1.7%	0.5%
	FAC	FAI	FAD	FMC	FMI	FMD
Diffuse	3.7%	0.3%	0.2%	4.0%	0.2%	0.2%
Model Type	6.5%	1.1%	0.5%	6.0%	1.4%	0.7%

Table IV-33

In-Use Fuel Economy Offset: Non-Modal Constant-Factor Analysis
... 12 Vehicle Technology Strata ...

Data Source : Model Type Consumer Data

Vehicle Technol	Number of Mdl	+++ EPA MPG +++			+++ Road MPG +++			GPM Ratio	GPMR Signf Diff@
		Min	HMAV	Max	Min	HMAV	Max		
R:A:C	573	13	19.4	32	11	16.0	32	1.216	100%
R:A:I	20	15	20.6	29	12	18.4	28	1.114	98%
R:A:D	27	22	25.9	30	18	23.1	29	1.120	100%
R:M:C	177	14	23.9	42	13	21.0	36	1.146	100%
R:M:I	17	19	23.6	32	15	22.2	31	1.073	100%
R:M:D	5	27	29.6	31	25	28.0	30	1.057	100%
F:A:C	64	18	25.2	32	13	21.3	29	1.180	1%
F:A:I	11	16	19.0	26	13	16.1	25	1.172	21%
F:A:D	5	25	24.9	26	20	20.9	22	1.190	45%
F:M:C	59	24	30.7	42	18	27.9	35	1.106	100%
F:M:I	14	21	28.7	33	20	27.6	34	1.039	100%
F:M:D	7	32	41.8	45	30	39.6	47	1.053	99%

This page intentionally
blank and un-numbered

Such simple multiplicative constant adjustment factors have a certain conceptual appeal. For example, one could find comfort in a system where the Label value is simply 0.83 times the EPA 55/45 fuel economy value. In analysis space this is the case when the GPMR is not a function of the EPA MPG, but has a constant value of 1.20.

To illustrate how simple constant adjustment factors can lead to inaccurate — or even erroneous — results, consider the following example.

The equations for GPMR are of the simple form EPA/ROAD = a + b EPA. If b is zero, Road = EPA/a as illustrated in Figure IV-3 for the two cases: a1 = 1.20 and a2 = 1.08. In MPG space ROAD1 = 0.83 EPA and ROAD2 = 0.93 EPA as shown in Figure IV-4. Since there is a greater shortfall (larger GPMR) for vehicle type 1, it falls below vehicle type 2 in MPG space and for any given EPA 55/45 fuel economy, vehicle type 2 is presumed to be "better" (higher label MPG value) than vehicle 1.

In Case B, shown in Figure IV-5, the GPMR appears to be MPG-dependent. For case B1, the GPMR is

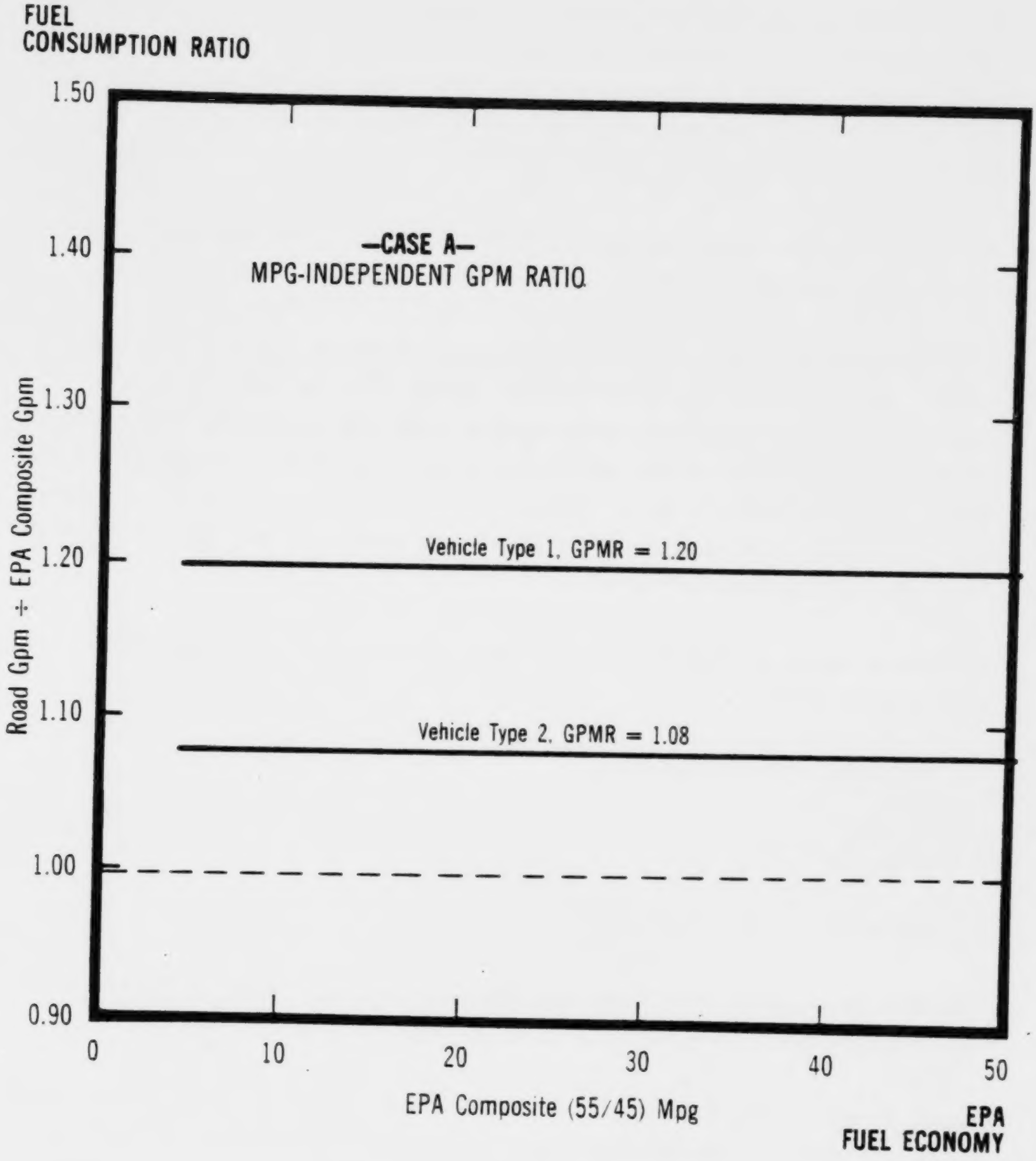
$$\text{EPA/ROAD} = 0.90 + 0.01\ \text{EPA}.$$

For case B2, it is

$$\text{EPA/ROAD} = 1.00 + 0.01\ \text{EPA}.$$

The MPG space plots for these two vehicle types are shown in Figure IV-6. Now vehicle type 1 is seen to be "better" than vehicle type 2.

Cases A and B are, however, just two different ways to look at the same data. In Case A, the MPG-dependence of the data is ignored in favor of a simple MPG-independent "correction factor" in MPG space. This is tantamount to condensing all the data in analysis space to its centroid and using that average value as the GPMR. In this example centroids are shown as the points 1* and 2* in Figure IV-5.



FIGURE

IV—3

Assumed Constant GPM Ratios for Two Vehicle Types

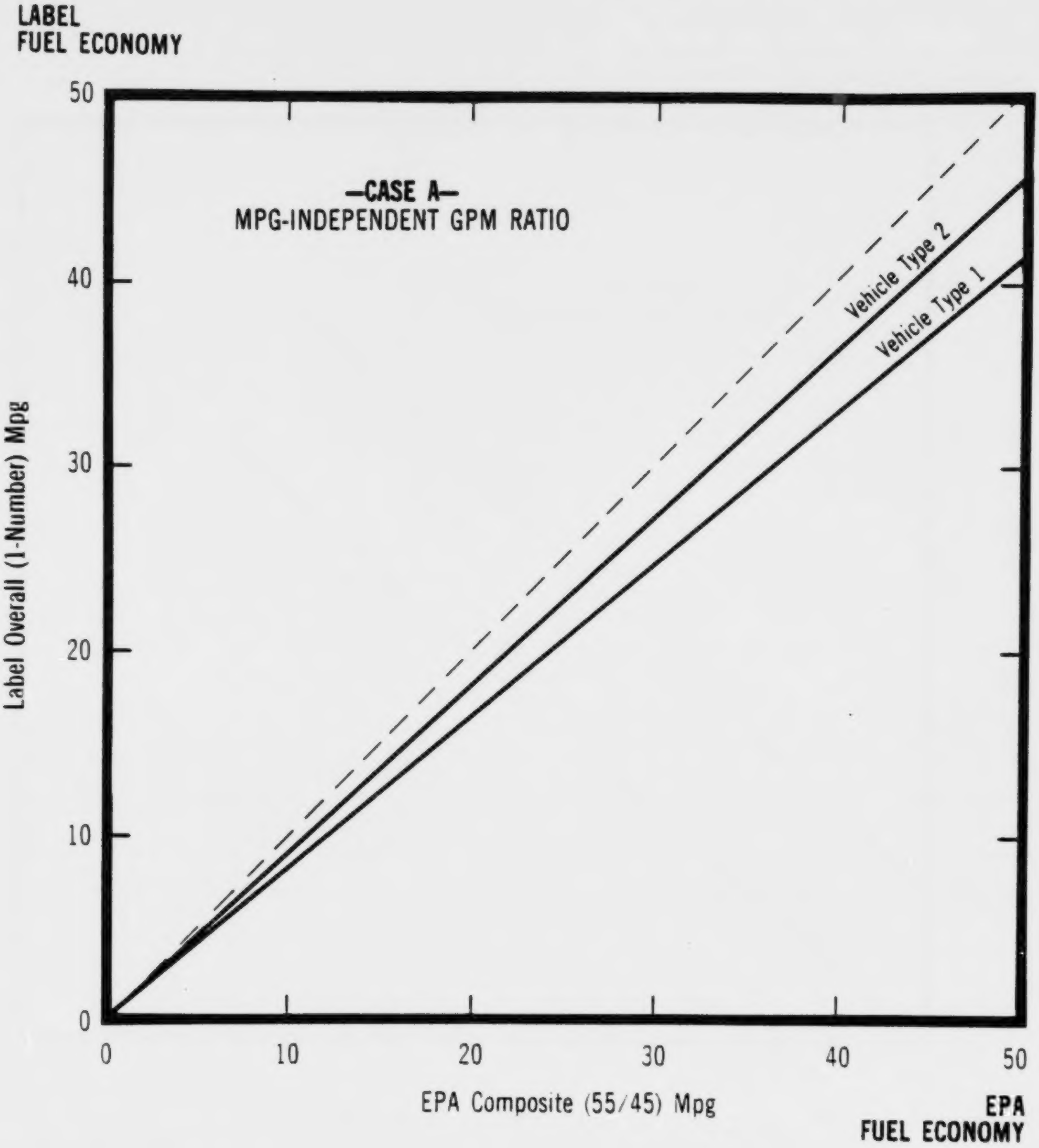


FIGURE
IV—4

Label Mpg Implications of Assumption of Constant Gpm Ratios for Two Vehicle Types

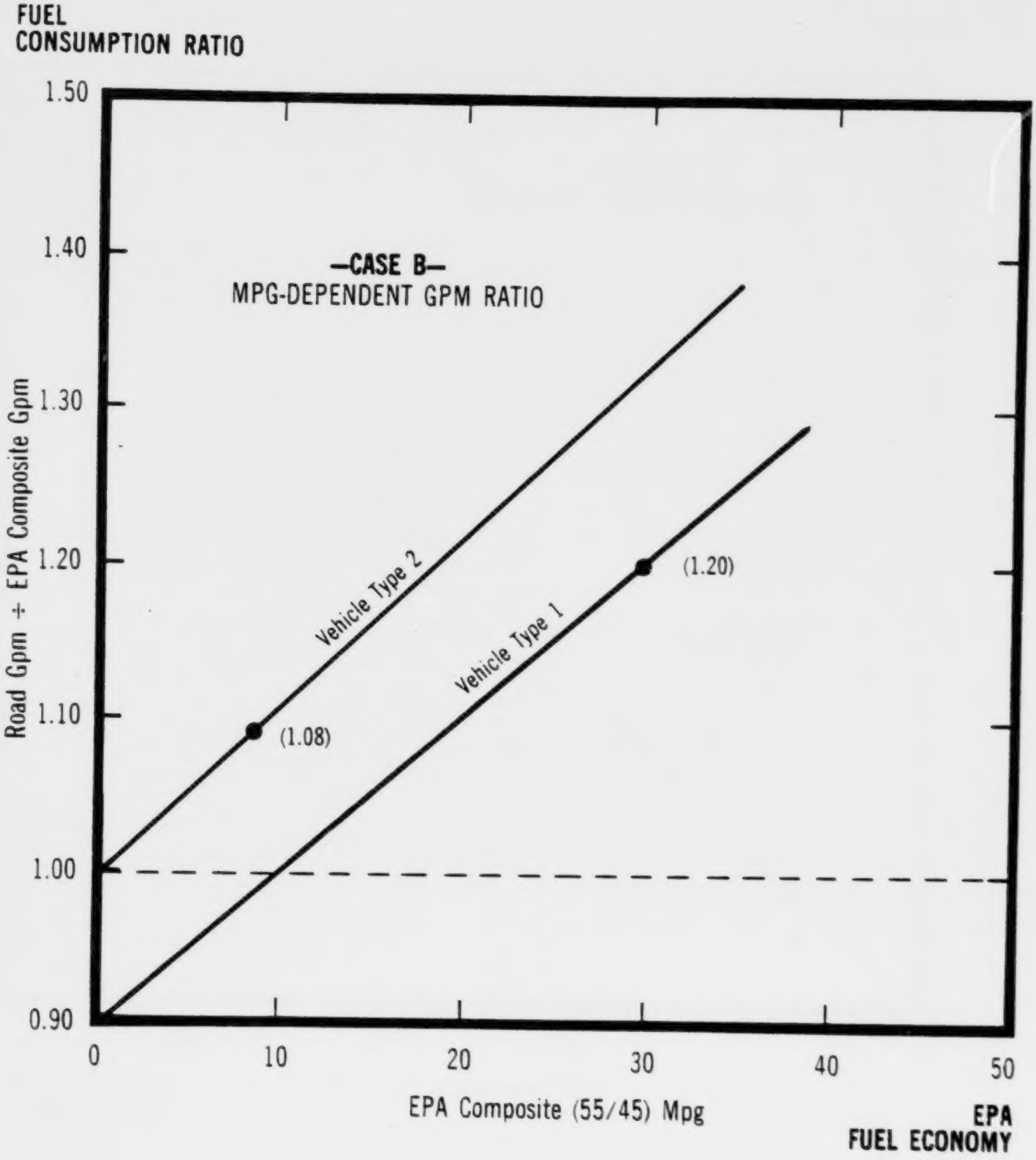


FIGURE
IV—5

Mpg-Dependent Gpm Ratios for Two Vehicle Types

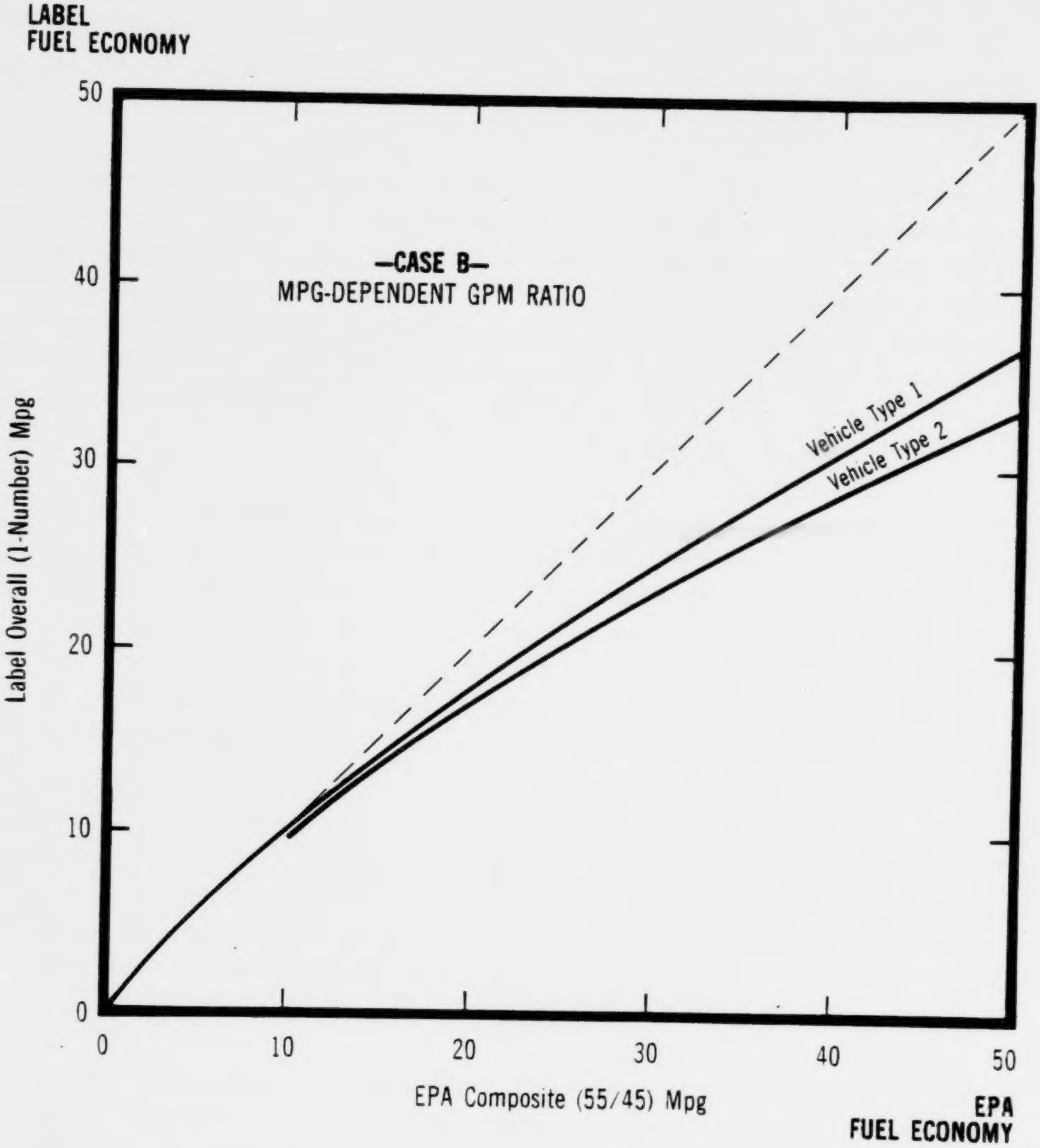


FIGURE
IV—6

Label Mpg Implications of Mpg-Dependent Gpm Ratios for Two Vehicle Types

The reason for the reversal between Cases A and B is obvious. Vehicle type 1 has a higher average GPMR than vehicle type 2, but its average EPA MPG is also higher.

Occasionally this sort of reversal actually occurred during the source-specific analyses to generate simple MPG-independent factors. It occured when vehicle type 1 was RMC and vehicle type 2 was RAC. Since the bulk of the 43,322 vehicle data base is made up of RAC and RMC data, we are very confident in saying that their GPMRs are MPG-dependent and that carbureted rear wheel manual transmission vehicles average better Road and EPA MPG than their automatic transmission counterparts. Hence, simple assumptions of MPG-independence of GPMR can be misleading.

Not all MPG-dependent analyses are inherently good or useful ones, however. Figure IV-7 is an analysis-space plot of the data from table IV-33. It suggests a decrease (improvement) in road fuel economy offset for higher EPA MPG levels, due to the higher MPG levels and lower GPMRs for the "higher technologies". The line of unweighted regression in the figure has, as in--use fuel economy data goes, a rather high correlation (R-value) of 0.64. If this regression equation were used for MPG adjustment, the adjustment algorithm would be

$$\text{Label MPG} = \frac{\text{EPA MPG}}{1.282 - 0.0061\ (\text{EPA MPG})}$$

which would give MPG adjustment factors of 0.819 at 10 MPG, and 1.024 at 50 MPG. Errors of 7% in average GPM ratio still exist for certain individual technologies.

This is a particularly dangerous adjustment equation. Although increasing EPA MPG via advanced technology usually gives less road shortfall (lower GPMR), EPA MPG improvements do not necessarily give less shortfall. EPA MPG can be increased, of course, without any technological improvement at all. It can be increased by beating the test. In such an occurrence, a vehicle gains double advantage with this MPG-dependent type of adjustment both by gaining paper EPA MPG and by an additional reward of less shortfall. To

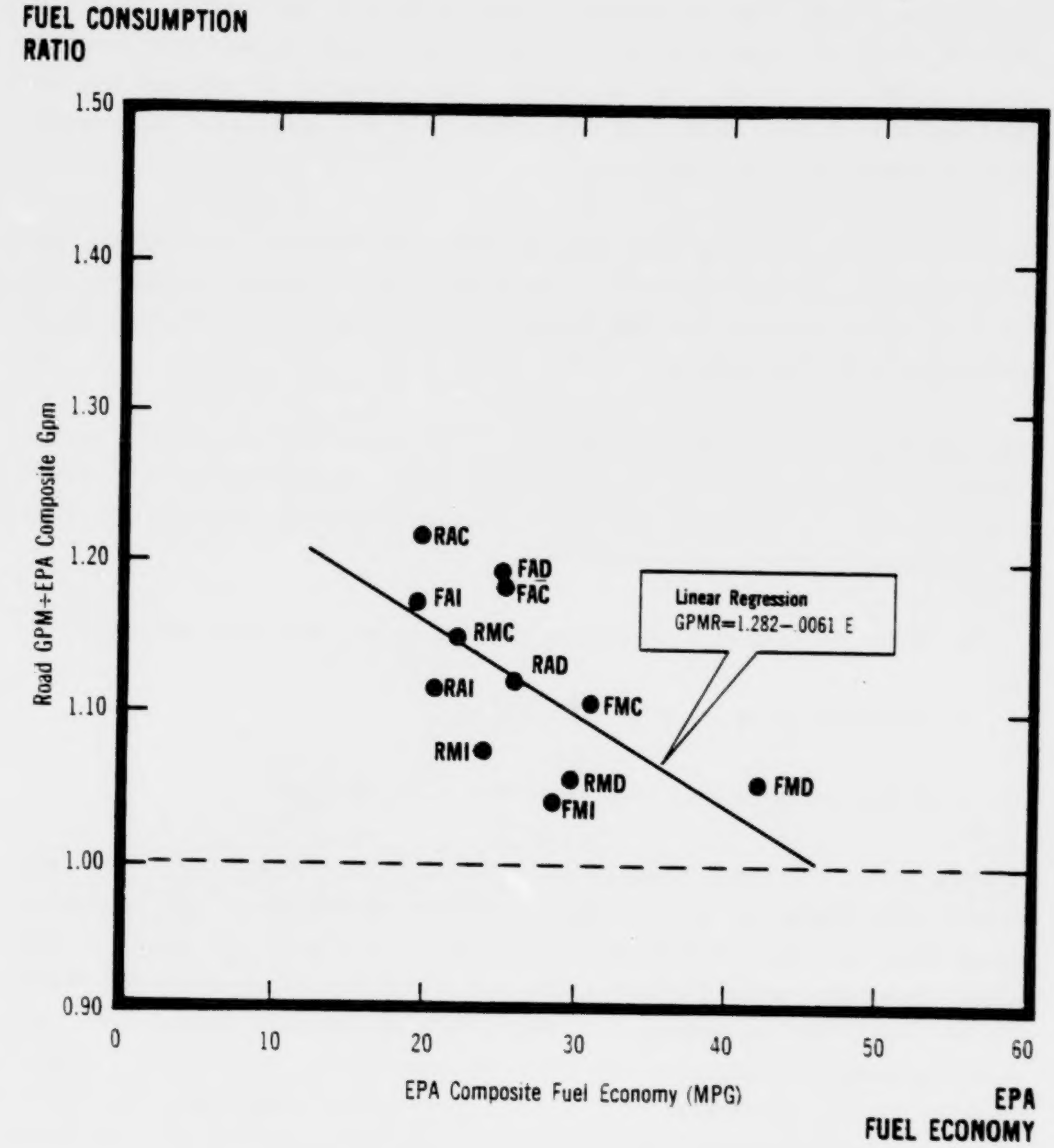


FIGURE
IV—7

Analysis Space Plot of In-Use Fuel Economy Offsets From Table IV-33 illustrate, using this adjustment formula a 25 EPA MPG vehicle would be labeled at 22 MPG (GPMR = 1.130). If a way were found to beat the test and get a 30 MPG EPA rating, the calculated label would be 27 MPG and the new GPMR would be 1.099. With this adjustment, a 5 MPG paper gain is rewarded with an additional 3.1% GPMR bonus.

If on the other hand the test somehow beats the vehicle, reducing its EPA MPG to 20 MPG, it would be doubly penalized: this adjustment assigns a GPMR of 1.160. The vehicle has been dealt a 5 MPG paper loss compounded by an additional 3.0% GPMR penalty.

MPG dependance: Analysis by technology - MPG dependence algorithms for the individual technologies are given in Table IV-34. Neglecting for the moment the generally low R-values, the twelve technologies would seem to fall into three groups of MPG-dependency behavior:

- o Offset worsens with increasing MPG: RAC, RMC, RMI, FAD, FMC, FMI
- o Too close to call: RMD, FAC, FMD
- o Offset improves with increasing MPG: RAI, RAD, FAI

Figures IV-8, IV-9, and IV-10 illustrate these MPG dependencies in analysis space. The blocks plotted for each technology correspond to the regression lines plus or minus one standard error, and contain some two thirds of the model type data points for that technology. Conclusions as to whether there is a "real" MPG dependence for individual technologies depend upon the criteria chosen as sufficient proof of the dependence. If it takes a sample size of 20 and an R-value of 0.20 to "prove" MPG dependence, four technologies have significant MPG dependence: RAC, RMC, and FMC with positive (worsening) slopes in the 0.006 to 0.01 range, and RAI with a negative (improving) slope of -0.007. However, if it takes a sample size of 50 and an R-value of 0.50 to prove MPG dependence, none of the technologies are significantly MPG-dependent.

Table IV-34

In-Use Fuel Economy Offset: Non-Modal MPG-Dependent Analysis
... 12 Vehicle Technology Strata ...

Data Source : Model Type Consumer Data

Vehicle Technol	Regression Equation E = EPA 55/45 MPG	R-Value	Std Err	Solutions at Min/Max EPA MPG				Actual GPMR Range
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.051 + .0083(E)	.277	.094	1.16	13	1.32	32	.838 - 1.531
R:A:I	GPMR = 1.272 - .0074(E)	.260	.109	1.16	15	1.06	29	.916 - 1.328
R:A:D	GPMR = 1.290 - .0065(E)	.157	.081	1.15	22	1.10	30	1.008 - 1.344
R:M:C	GPMR = .999 + .0059(E)	.294	.103	1.08	14	1.25	42	.884 - 1.578
R:M:I	GPMR = .849 + .0092(E)	.390	.102	1.02	19	1.15	32	.913 - 1.307
R:M:D	GPMR = 1.055 + .0001(E)	.005	.039	1.06	27	1.06	31	1.030 - 1.114
F:A:C	GPMR = 1.178 + .0001(E)	.002	.096	1.18	18	1.18	32	.944 - 1.408
F:A:I	GPMR = 1.584 - .0211(E)	.774	.067	1.25	16	1.03	26	1.012 - 1.319
F:A:D	GPMR = .925 + .0107(E)	.205	.039	1.19	25	1.20	26	1.145 - 1.240
F:M:C	GPMR = .798 + .0099(E)	.440	.094	1.04	24	1.21	42	.871 - 1.551
F:M:I	GPMR = .928 + .0038(E)	.165	.070	1.01	21	1.05	33	.962 - 1.221
F:M:D	GPMR = 1.089 - .0009(E)	.048	.090	1.06	32	1.05	45	.961 - 1.201

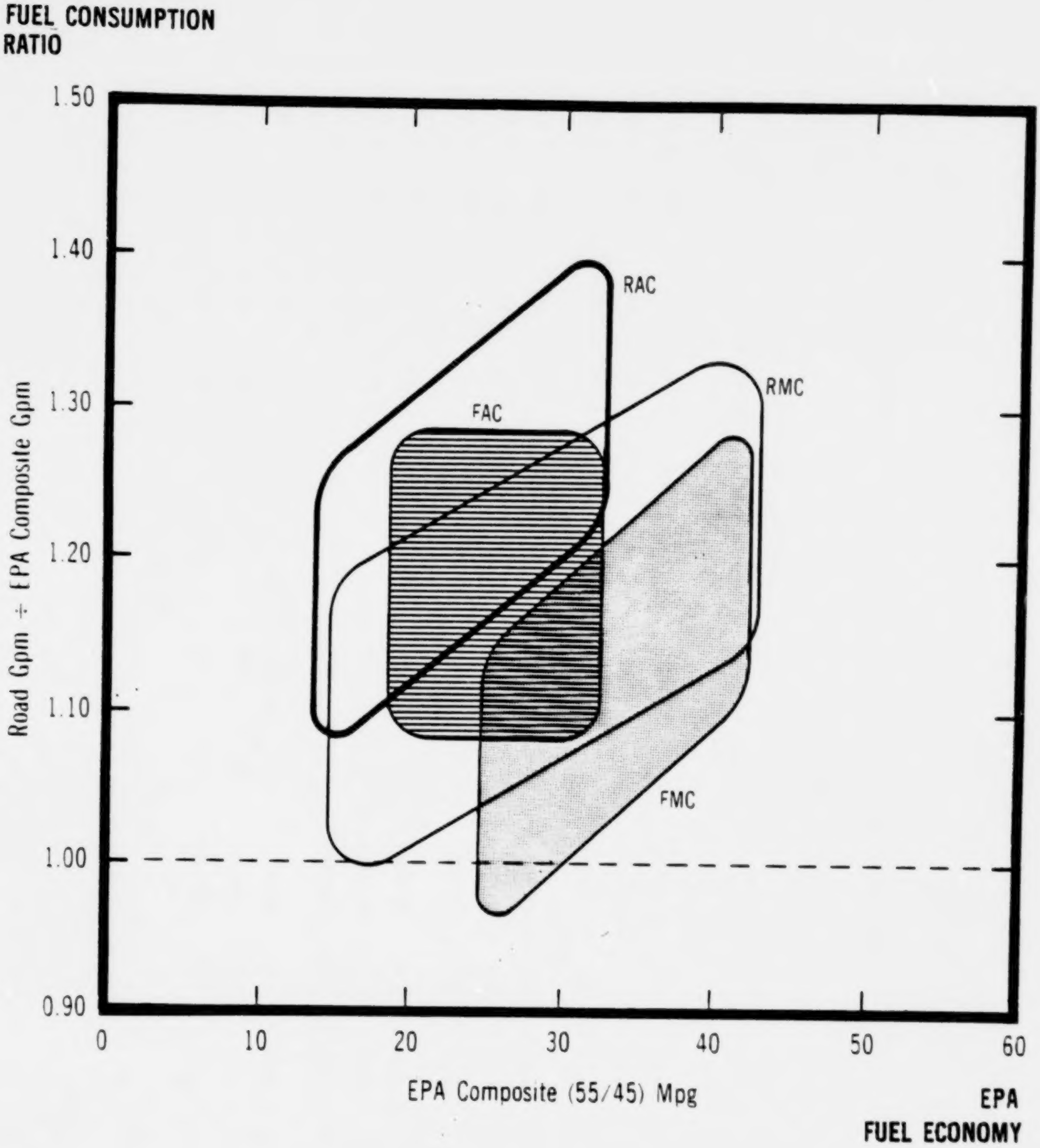


FIGURE
IV—8

Technology Specific Gpm Ratio:
GASOLINE CARBURETED

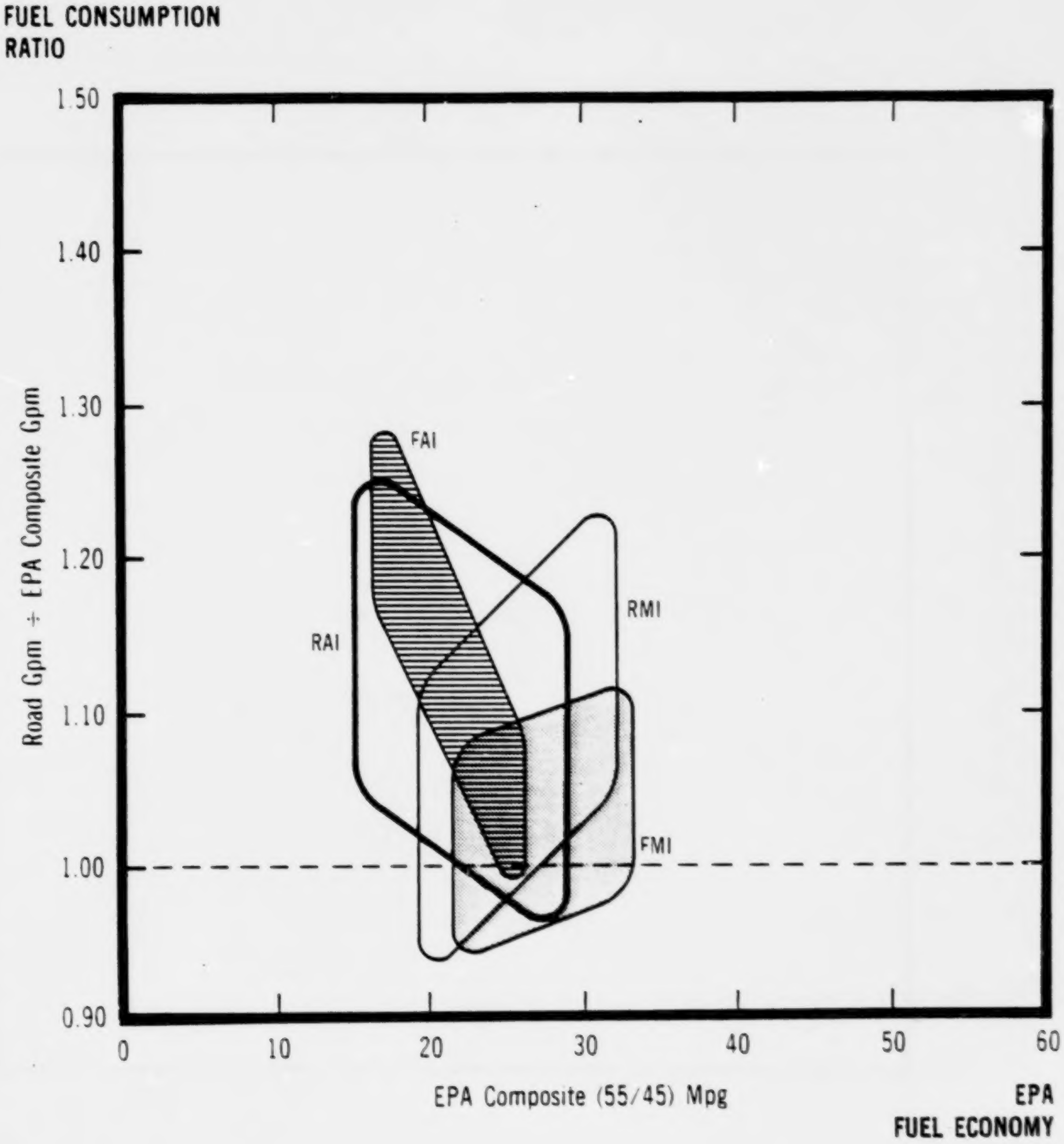
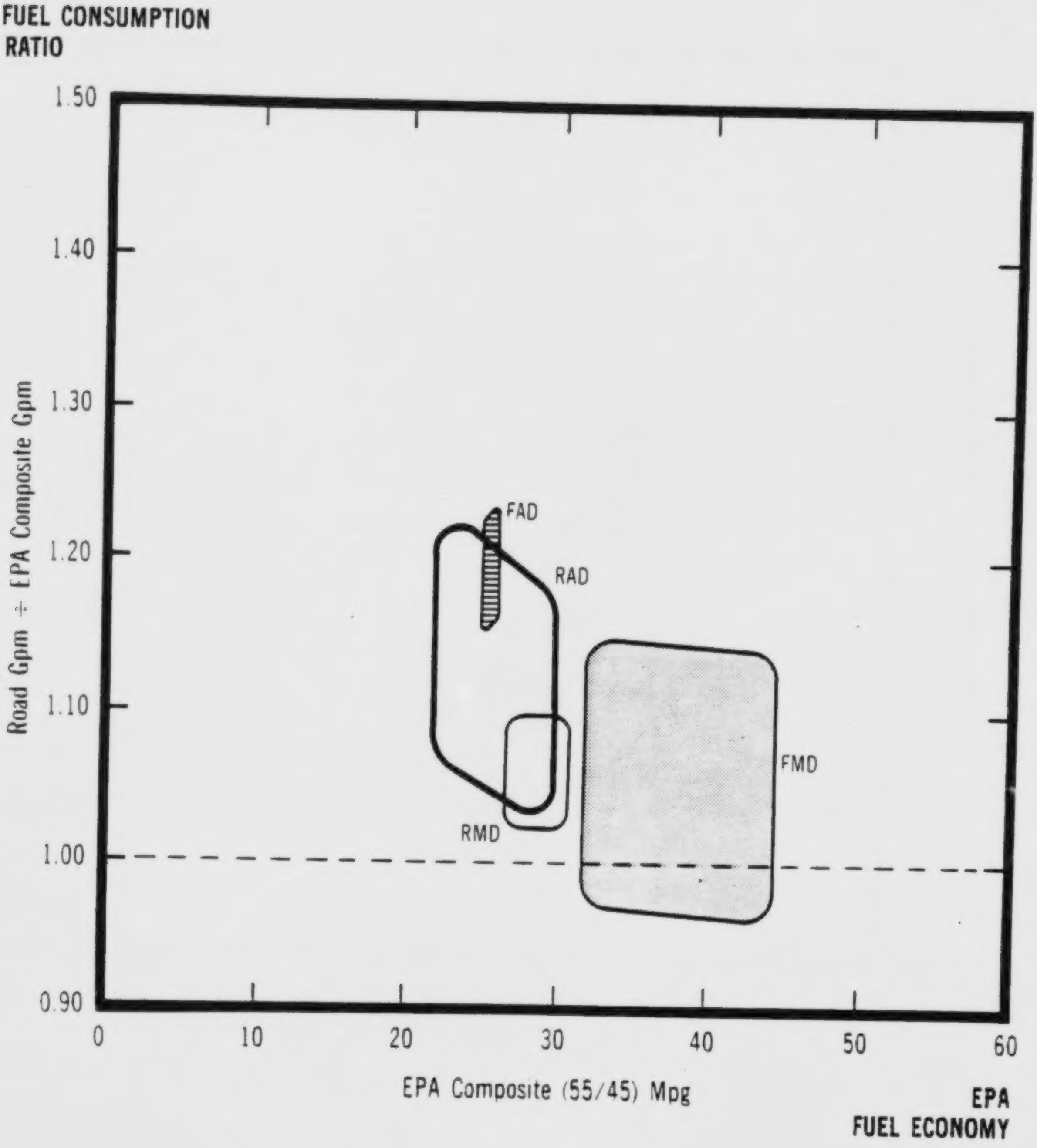


FIGURE
IV—9

Technology Specific Gpm Ratio: GASOLINE FUEL INJECTED



FIGURE

IV—10

Technology Specific Gpm Ratio: DIESEL

This page intentionally
blank and un-numbered

As a second illustration of the importance of MPG dependence, consider the comparison detailed in Table IV-35. In this example, two types of vehicles are to be labeled: RAC vehicles and FMC vehicles. The MPG-dependent GPMR algorithms (from Table IV-34) for these technologies are shown, along with their constant, non-MPG-dependent GPMR factors from Table IV-33. Also shown is an assumed universal constant factor intermediate between the two technologies' constant factors.

The label values computed from these three approaches are given for three different EPA-MPG versions of each of the two technologies. If the technology-specific MPG-dependent adjustment represents "truth", it is seen that large label errors can result from use of the oversimplified universal-constant and technology-constant approaches.

Thus the question of technology specificity and MPG dependence is not a trivial one. It is too important to leave it on a note of uncertainty, or, alternatively, to force it to a conclusion by arbitrary selection of proof criteria. Additional inquiry is warranted.

Table IV-35

Illustration of Consequences of
Three Adjustment Approaches

GPM Ratio:	RAC Vehicle	FMC Vehicle
MPG-dep. technology factor*	1.051 + .0083E	.798 + .0099E
Technology constant factor**	1.216	1.106
Universal constant factor***	1.15	1.15

	RAC Vehicle			FMC Vehicle		
Adjusted (Label) MPG:	E=20	E=30	E=40	E=20	E=30	E=40
MPG-dep. technology factor	16.4	23.1	28.9	20.1	27.4	33.5
Technology constant factor	16.4	24.7	32.9	18.1	27.1	36.2
Universal constant factor	17.4	26.1	34.8	17.4	26.1	34.8

	RAC Vehicle			FMC Vehicle		
Label Error Relative to MPG-dep. Technology Factor:	E=20	E=30	E=40	E=20	E=30	E=40
Technology constant factor	0	+2	+4	-2	0	+2
Universal constant factor	+1	+3	+6	-3	-1	+1

Unwarranted Disadvantage Imposed on FMC vehicle:	E=20	E=30	E=40
Technology constant factor	2MPG	2MPG	2MPG
Universal constant factor	4MPG	4MPG	5MPG

---

* From Table IV-34.

** From Table IV-33.

*** An assumed value between 1.216 and 1.106.

Discovered: an Explanatory Variable

Recognizing that the independent variable, EPA MPG, is probably a surrogate for some vehicle technical parameter which is the true causative agent, vehicle parameters which are collinear with MPG level were reviewed. The most obvious of these are vehicle weight and engine size.

Weight was not investigated because the actual road weights of the vehicles in the data base are unknown*.

Analyses performed using engine displacement and cylinder count as explanatory variables produced results similar to each other, with cylinder count yielding the clearer pattern of behavior. Therefore, only the cylinder count analysis is discussed here.

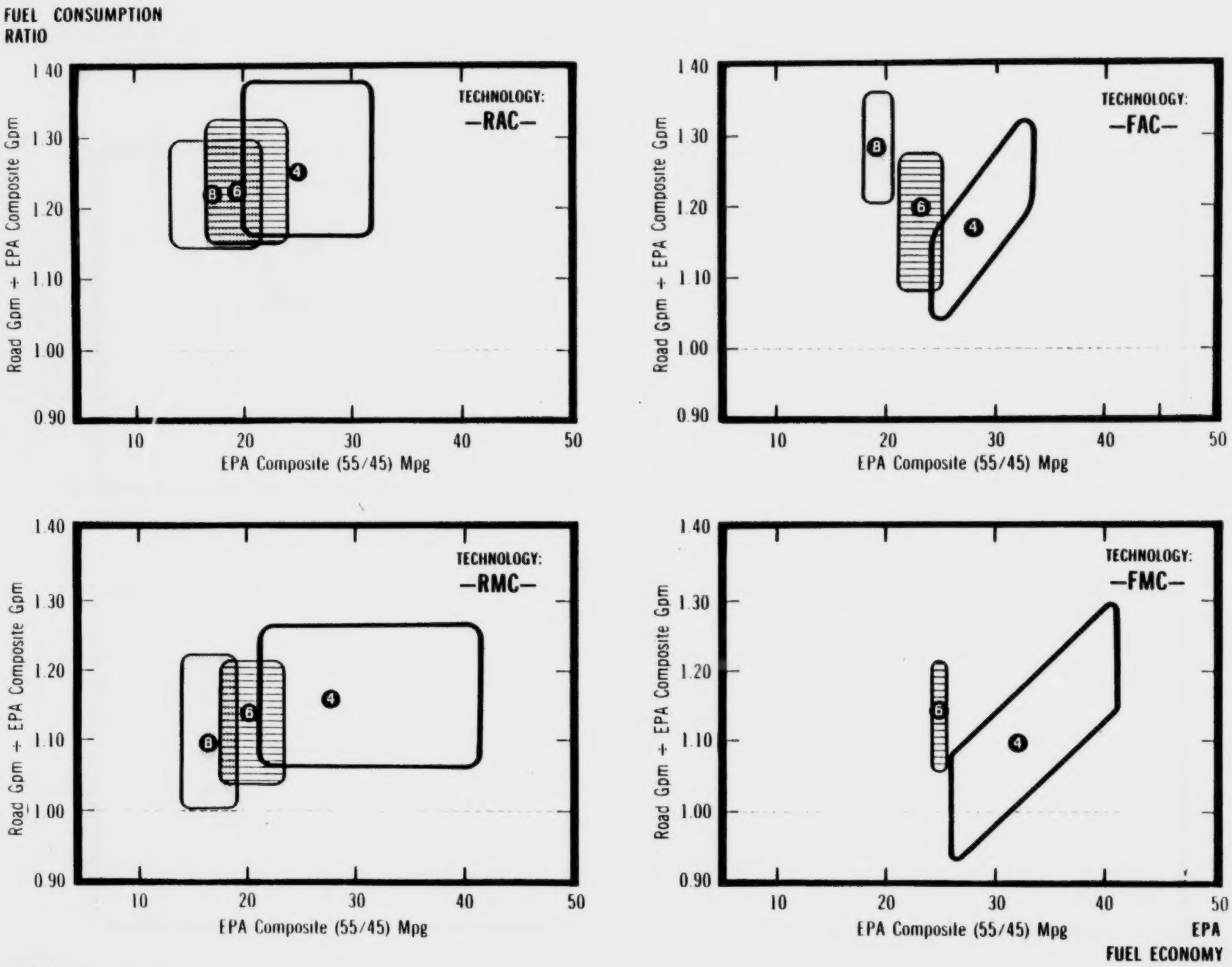
Figures IV-11 through IV-22 characterize the road offset data in analysis space for vehicles with 4, 5, 6, and 8-cylinder engines. Each block encloses two thirds of the data for its respective technology and cylinder count, and was based on a scatter plot of the data, rather than on computed standard deviations, although the two produce very similar results. The centroids of each cylinder count data block are shown as small circles enclosing the cylinder count.

For individual technology/cylinder count (Tech/Ncyl) strata, there are only a few hints of MPG dependence. Of the 29 such strata, two (FAC4 and FMC4) show significant MPG dependence, both having sample sizes exceeding 30 and R-values exceeding 0.50. Their MPG-dependent slopes are 0.020 and 0.014 respectively.

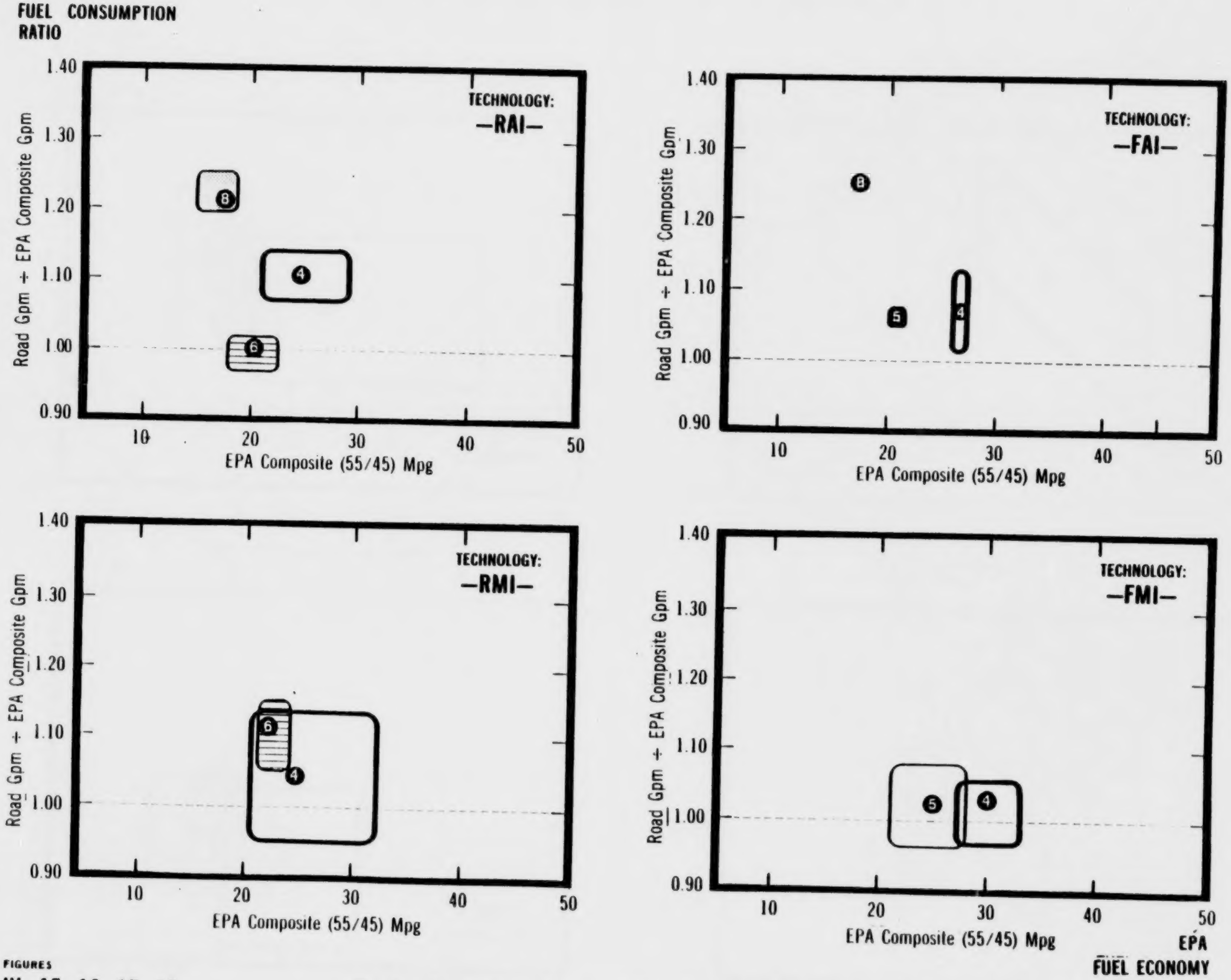
To interpret these figures in terms of what they tell us about the MPG dependence of road offset for the twelve technologies, sample sizes of the cylinder count subsets must be considered. If there is some natural MPG dependence, it is to be found in the RAC and RMC data, which together account for 77% of all of the model type data (59% and 18% respectively).

---

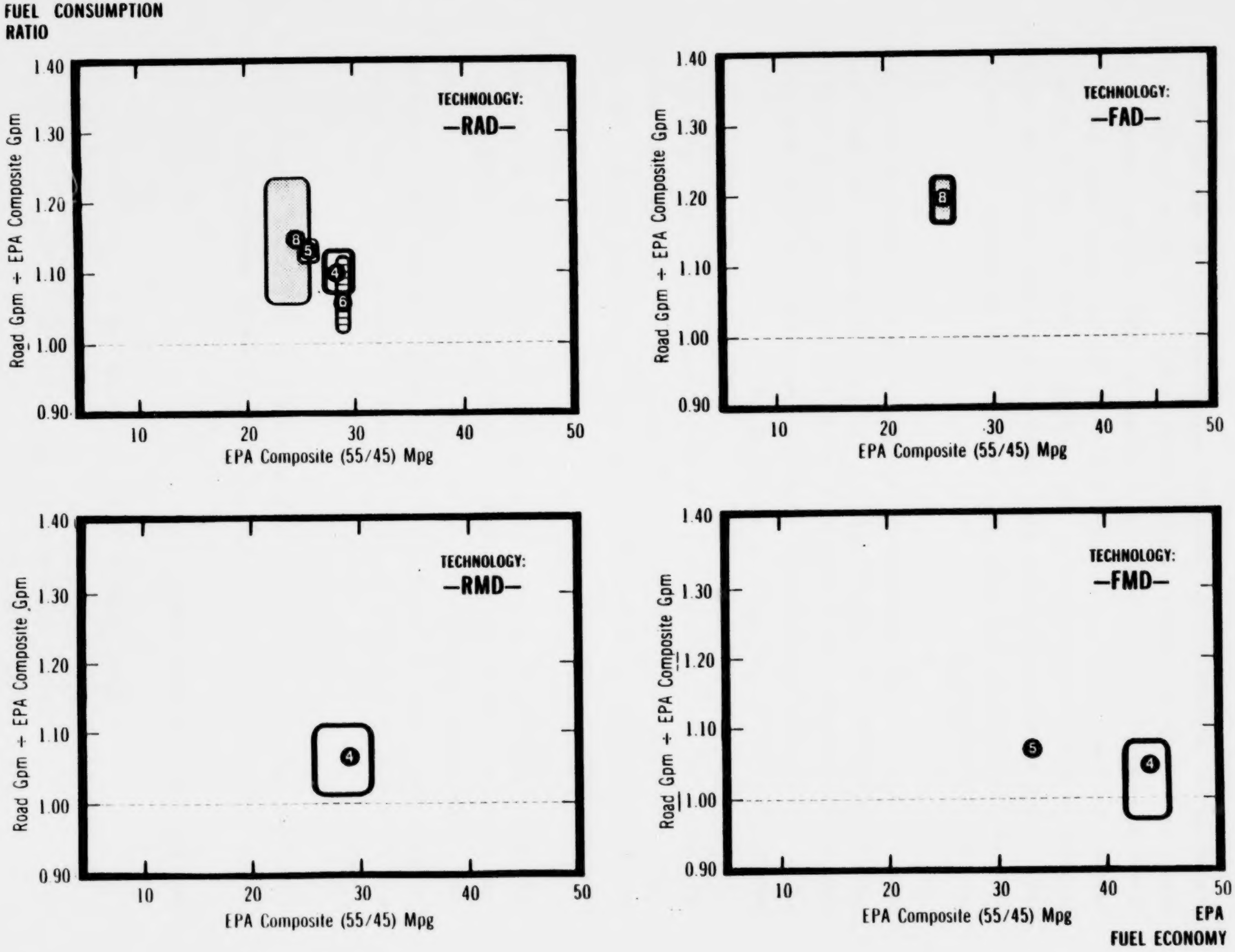
* For some of the vehicles, EPA certification inertia weights have been estimated, but even for these vehicles there is no way of knowing their weight on the road.



FIGURES
IV–11, 12, 13, 14, Technology-Specific Gpm Ratio, by Cylinder Count



FIGURES
IV—15, 16, 17, 18, Technology-Specific Gpm Ratio, by Cylinder Count



FIGURES
VI—19, 20, 21, 22

Technology-Specific Gpm Ratio, by Cylinder Count

Figure IV-23 illustrates that when the regression line for all RAC data is compared with the cylinder-specific average "spots", its slope appears high, especially as far as predicting the FE offset of the 4-cylinder group. This happens because of the sample distribution of the RAC data among the three cylinder subsets: 52% 8-cylinder, 32% 6-cylinder, and only 16% 4-cylinder. The RMC all-cylinder regression line, however, is a good fit to the cylinder-specific data (the RMC data are distributed 10% 8-cylinder, 29% 6-cylinder, and 61% 4-cylinder).

Interestingly, a line constructed through the RAC cylinder-specific data points themselves runs exactly parallel (slope = 0.0059) to the RMC slope. Thus an MPG-dependent slope of 0.0059 actually turns out to be the best-fit slope for both RAC and RMC data, when the overrepresentation of 8-cylinder RACs in this particular sample is corrected for.

This model of the behavior of these two strata implies that there is a constant difference in GPMR of about 0.10 due to the use of manual transmissions, compared to automatics, and this "technology effect" is not dependent upon cylinder count.

For other technologies, a model of cylinder-independent effect on GPM ratio does not usually hold. In fact, what we observe is that the various alternate technologies usually affect the GPM ratio in a highly cylinder-dependent way. This is obvious from figures IV-24 through IV-26, which are cylinder-specific replots of the Tech/Ncyl centroids from the earlier figures.

The method used to estimate the cylinder-specific GPM ratio effect of the various technologies is illustrated using the following example.

Consider four Tech/Ncyl cases:

RAC4, GPMR = 1.246 at 25.23 MPG
RMC4, GPMR = 1.159 at 28.15 MPG
FAC4, GPMR = 1.165 at 27.30 MPG
FMC4, GPMR = 1.102 at 31.93 MPG

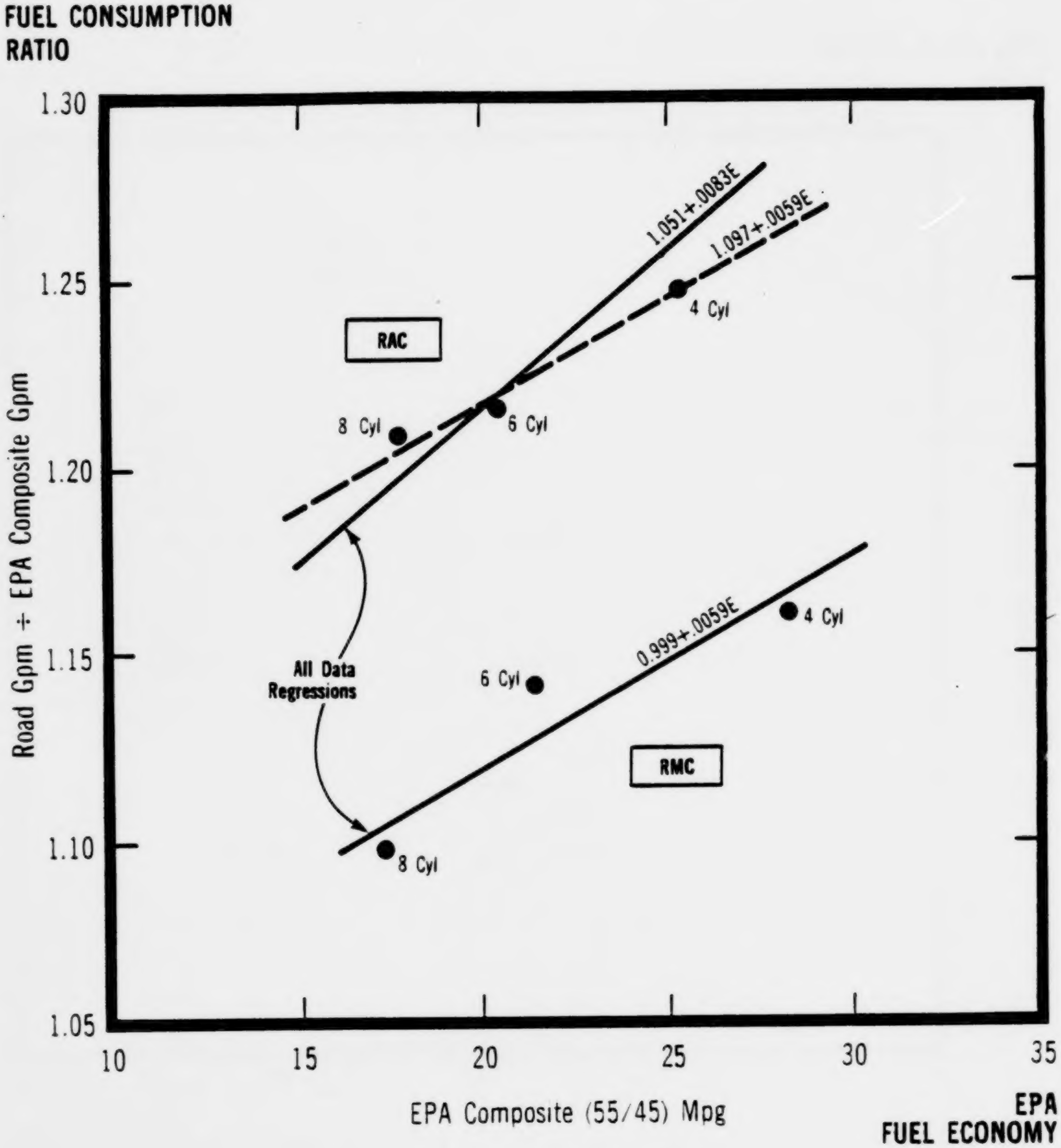


Figure
IV—23

MPG Dependence for RAC and RMC Vehicles, by Cylinder Count

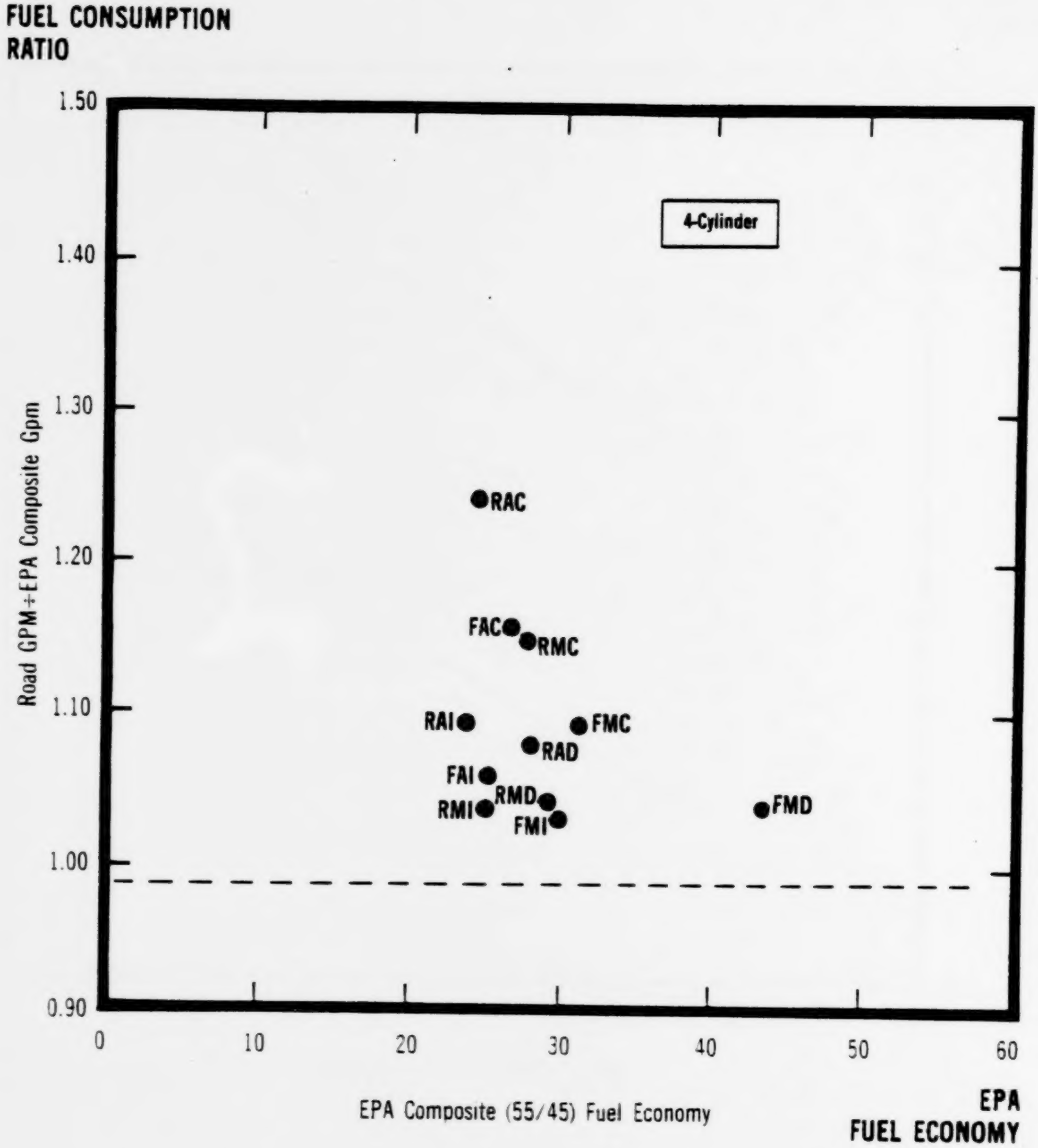


Figure
IV—24

Technology Specific Average GPM Ratio, Vehicles with 4—Cylinder Engines

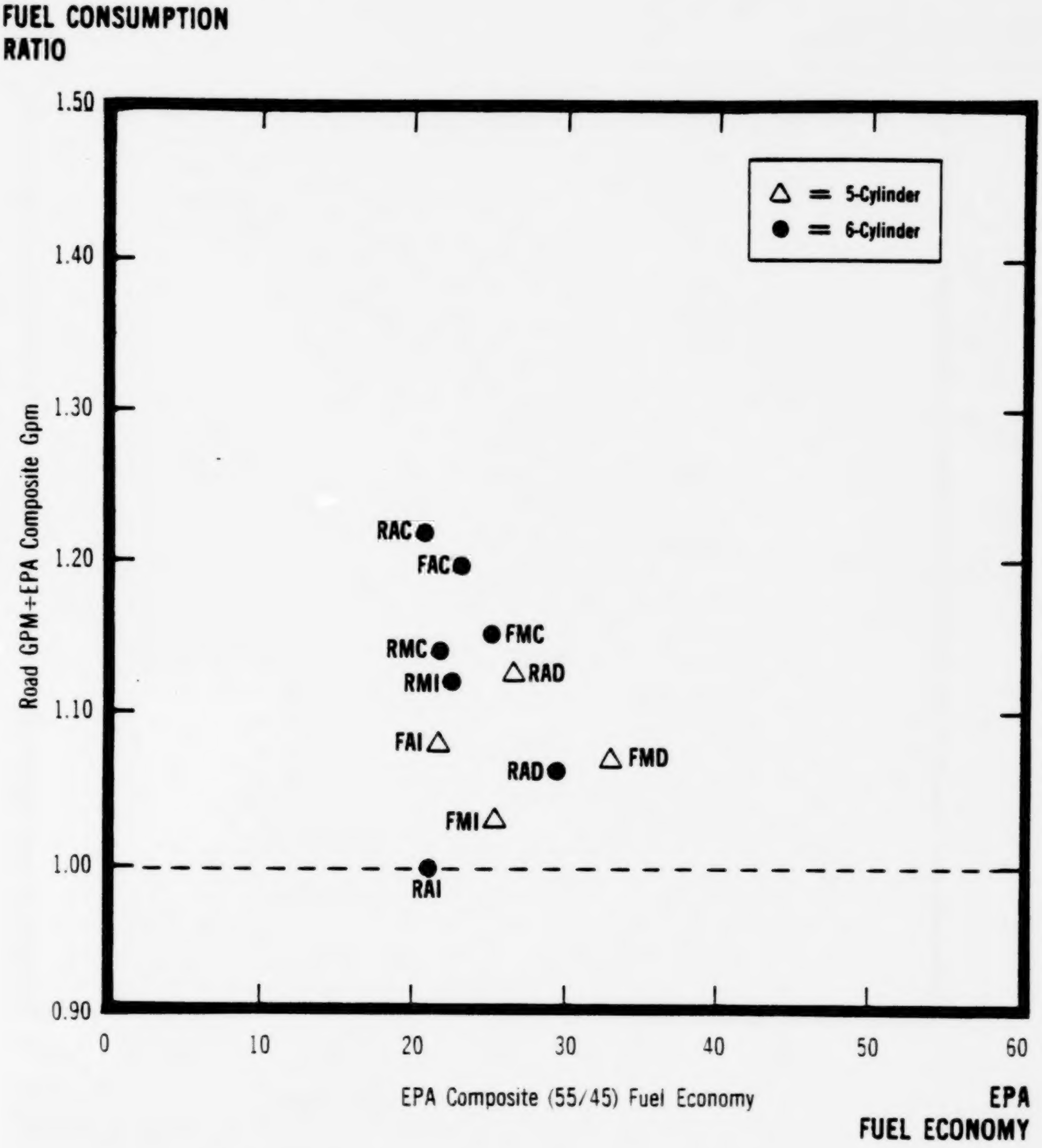


Figure
IV—25

Technology Specific Average
GPM Ratios—Vehicles with 5— and 6—Cylinder Engines

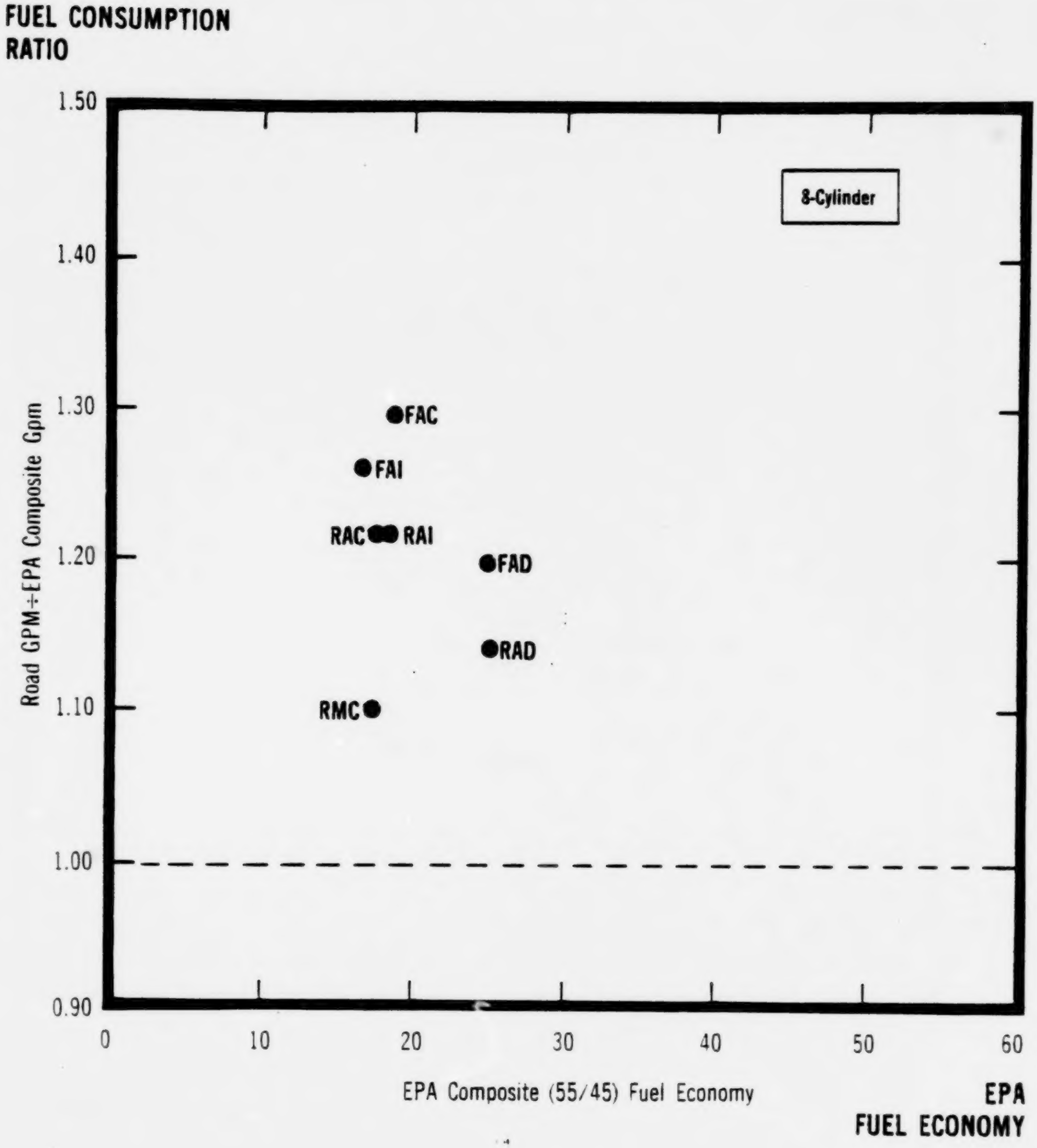


Figure
IV—26

**Technology Specific GPM Ratio—
Vehicles with 8—Cylinder Engines**

There are two ways of estimating the effect of manual transmission on the GPMR of 4-cylinder engine vehicles: by comparing RMC4 to RAC4, and by comparing FMC4 to FAC4. Since the Tech/Ncyl points occur at different MPG values, however, MPG adjustment is required, using the natural MPG dependence slope of 0.0059.

Thus, one estimate of the effect of manual transmission is:

$$\Delta GPMR_{MAN4} = GPMR_{RMC4} - GPMR_{RAC4} \rbrack_{MPG_{RMC4}}$$

where $GPMR_{RAC4} \rbrack_{MPG_{RMC4}}$ means "the GPMR of RAC4 evaluated at the MPG of the RMC4 to which it is being compared".

At 28.15 MPG, the RAC4 GPMR value is 1.263, so

$$\Delta GPMR_{MAN4} = 1.159 - 1.263 = -\underline{0.104}.$$

The other direct estimate of $\Delta GPMR_{MAN4}$ is:

$$\begin{aligned}\Delta GPMR_{MAN4} &= GPMR_{FMC4} - GPMR_{FAC4} \rbrack_{MPG_{FMC4}} \\ &= 1.102 - GPMR_{FAC4} \rbrack_{31.93} \\ &= 1.102 - 1.192 = -\underline{0.090}.\end{aligned}$$

Similarly, the effect of front wheel drive can be estimated by comparing FAC4 to RAC4 and FMC4 to RMC4, with the results -0.093 and -0.085, respectively.

But these are not the only possible estimates of the effects of manual transmission and front wheel drive. They are only the primary estimates, derived by comparing technology pairs that are different by only one of the three technology descriptors. Secondary estimates can also be made. The effect of manual transmission can be additionally estimated by comparing the FMC and RAC GPM ratios and "backing out" the front wheel drive portion of that two-technology difference. Similarly, a secondary estimate of the front wheel drive effect can be developed from the same FMC vs RAC comparison by backing out the manual transmission contribution.

To illustrate, the combined effect of manual transmission and front wheel drive is:

$$\triangle GPMR_{FWD+MAN} = GPMR_{FMC} - GPMR_{RAC} \Big]_{MPG_{FMC}}$$

$$= 1.102 - 1.258 = -0.156.$$

Now, the average effect of front wheel drive (FWD) from the two primary estimates is -0.089 (the average of -0.093 and -0.085), so a secondary estimate of the MAN effect is:

$$-0.156 - (-0.089) = -0.067.$$

Likewise, the average primary MAN effect is -0.097 (the average of -0.104 and -0.090), giving a secondary FWD effect estimate of:

$$-0.156 - (-0.097) = -0.059.$$

Thus we have three estimates of the MAN effect:

-0.104, -0.090 and -0.067

and three estimates of the FWD effect:

-0.093, -0.085 and -0.059.

By including secondary (and in a few instances, tertiary) estimates of individual technologies' effects on GPMR, we account at least partially for possible synergisms or antagonisms arising from combinations of the technologies.

This method was applied using all of the 29 Tech/Ncyl centroid values to compute every possible estimate of cylinder-specific GPMR sensitivity to technology. Figure IV-27 is a four-graph illustration of the results. For front wheel drive and fuel injection, there is quite a dramatic dependence of GPM ratio effect upon cylinder count. For 4-cylinder cars, fuel injection typically improves GPMR by 9 percentage points, and front wheel drive improves GPMR by 7 points; for 8-cylinder cars, however, fuel injection shows no benefit at all and front wheel drive worsens GPMR by some 6 points. For manual transmission and Diesel technologies, the GPMR effect is not significantly cylinder dependent. Regressions of manual and Diesel GPMR against cylinder count show slopes an order of magnitude lower than those of front drive and fuel injection, and R-values below 0.20.

Non-modal Adjustment System

From the above analysis, we may write a general equation for the GPM ratio of RAC vehicles,

$$\mathrm{GPMR}_{RAC} = 1.097 + 0.0059\ (E)$$

and difference equations for other technologies' GPMR departure from the RAC equation:

$$\Delta\mathrm{GPMR}_{FWD} = -0.185 + 0.0300\ (\mathrm{Ncyl})$$

$$\Delta\mathrm{GPMR}_{MAN} = -0.070$$

$$\Delta\mathrm{GPMR}_{INJ} = -0.184 + 0.0225\ (\mathrm{Ncyl})$$

$$\Delta\mathrm{GPMR}_{DSL} = -0.142$$

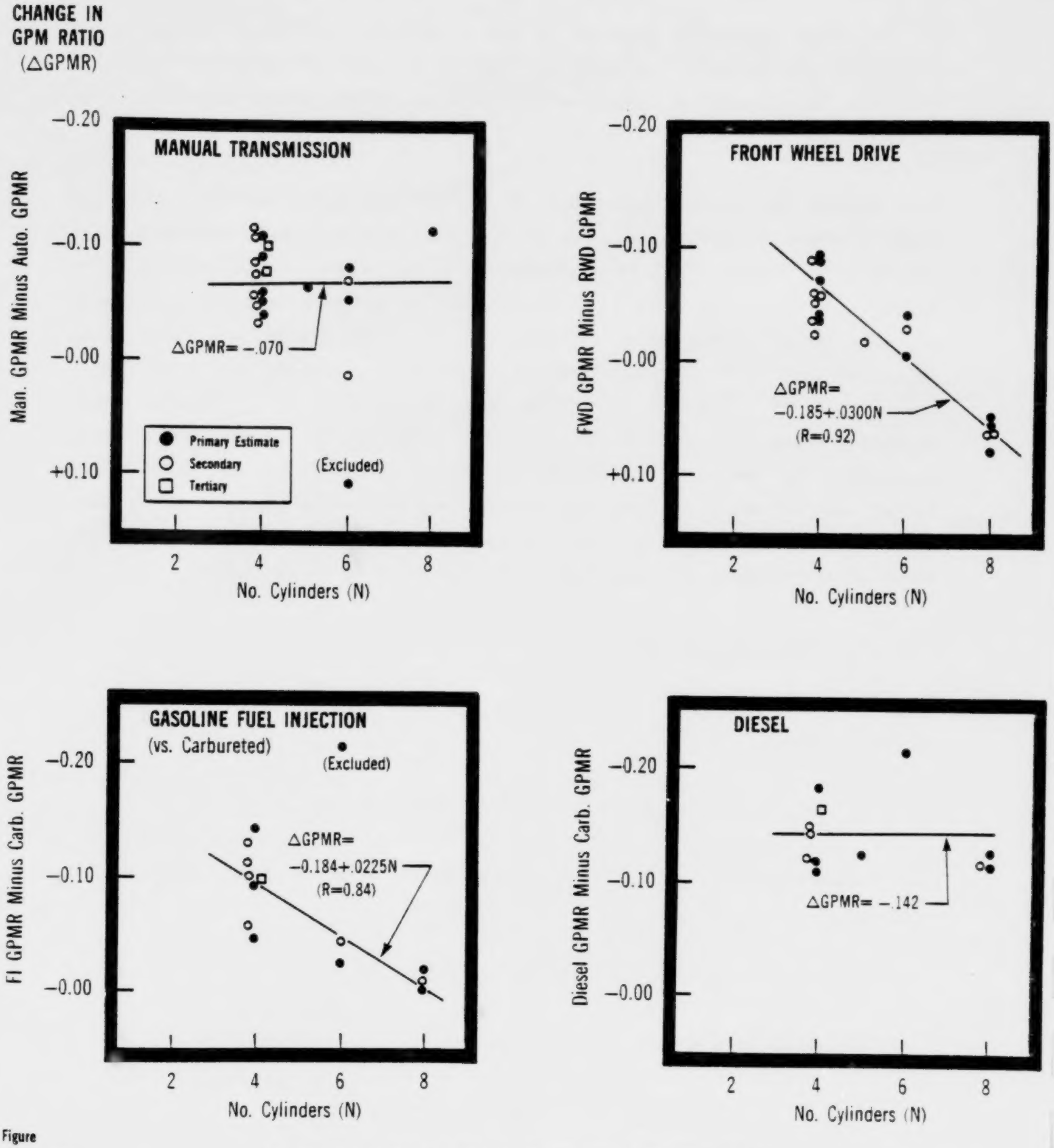


Figure
IV—27

Cylinder—Dependent Effects of Technology on the GPM Ratio

Thus a general equation for GPMR is:

$$\text{GPMR} = f(\text{RAC}) + \Delta f(\text{Tech, Ncyl})$$

$$= 1.097 + 0.0059(E) + \Delta f(\text{Tech, Ncyl})$$

or

$$\text{GPMR} = 1.097 + 0.0059(E) + \text{FWD}(-.185 + .0300N) + \text{MAN}(-.070) + \text{INJ}(-.184 + .0225N) + \text{DSL}(-.142)$$

where
E = EPA composite Fuel Economy
FWD = 1 if front drive, zero if rear drive
MAN = 1 if manual, zero if automatic
INJ = 1 if gasoline FI, zero if carb. or Diesel
DSL = 1 if Diesel, zero if carb. or gasoline FI
N = cylinder count

For example, a 25 MPG 6-cylinder RMI vehicle has a GPMR of:

$$\text{GPMR}_{6\text{RMI}} = 1.097 + 0.0059(25) + 0[-.185 + .0300(6)] + 1[-.184 + .0225(6)] + 1[-.070] + 0[-.142]$$

$$= \underline{1.126}$$

GPM ratios for the 29 Tech/Ncyl sets, calculated using this general equation, are compared to the actual GPM ratios in Table IV-36. The calculated GPMR is within five percentage points of actual GPMR for all cases except 6-cylinder RAI and RAD vehicles, whose calculated GPMRs are 0.171 and 0.065 high, respectively.

Table IV-36

Comparison of Road GPM Ratio and Calculated GPM Ratio, Non-Modal Adjustment System

	..... 4-Cylinder			..... 5-Cylinder			..... 6-Cylinder			..... 8-Cylinder		
Vehicle Technology	EPA MPG	Actu GPMR	Calc GPMR	EPA MPG	Actu GPMR	Calc GPMR	EPA MPG	Actu GPMR	Calc GPMR	EPA MPG	Actu GPMR	Calc GPMR
RAC	25.2	1.246	1.246	--	---	---	20.5	1.215	1.218	17.8	1.209	1.202
RAI	24.4	1.104	1.147				20.7	0.999	1.170	18.0	1.209	1.199
RAD	28.6	1.090	1.124	26.1	1.123	1.109	29.0	1.061	1.126	25.0	1.135	1.103
RMC	28.1	1.159	1.193	--	---	---	21.4	1.140	1.153	17.3	1.095	1.129
RMI	25.5	1.048	1.083	--	---	---	22.2	1.118	1.109	--	---	---
RMD	29.7	1.057	1.060	--	---	---	--	---	---	--	---	---
FAC	27.3	1.165	1.193	--	---	---	22.8	1.194	1.227	18.5	1.284	1.261
FAI	25.8	1.069	1.090	21.1	1.078	1.115	--	---	---	16.8	1.253	1.247
FAD	--	---	---	--	---	---	--	---	---	24.9	1.190	1.157
FMC	31.9	1.102	1.150	--	---	---	24.6	1.150	1.167	--	---	---
FMI	30.1	1.042	1.046	25.0	1.030	1.069	--	---	---	--	---	---
FMD	43.9	1.051	1.079	32.4	1.070	1.041	--	---	---	--	---	---

To illustrate the effectiveness of this general GPMR equation in terms of adjusted MPG values, the labeling equation below is used:

L = E/GPMR where L = Label MPG
E = EPA MPG
and GPMR = GPM ratio from
the general equation.

The adjusted MPG values calculated for the 29 Tech/Ncyl sets using their average EPA MPG figures are compared with average actual road MPG in Table IV-37. There are average errors of -0.7 and -0.9 MPG, respectively, for 4-cylinder and 6-cylinder vehicles. (Note that negative MPG errors are conservative, erring on the side of the consumer).

The adjusted MPG values in Table IV-37 compare much more favorably with the road values than do the unadjusted values. In 27 of the 29 cases the adjusted values are closer to the road MPG than are the unadjusted EPA numbers. The weighted average difference changes from being 2.9 MPG high for the unadjusted values, to being within 0.6 MPG for the adjusted values. These weighted average differences are based on the projected 1985 mix of Tech/Ncyl combinations.

Upon further examination of Table IV-37, we note that the adjustment is too stringent for 4-cylinder non-RAC vehicles, producing average label values that are 1 MPG too low, with some consistency. These 4-cylinder non-RAC vehicles are projected to make up more than half of the 1985 fleet. The 6-cylinder non-RAC vehicles (projected to make up nearly 20% of the 1985 fleet) are also somewhat underlabeled by the general equation although not quite as consistently as the 4-cylinder non-RACs.

In terms of GPM ratio, the average GPMR error for 4-cylinder non-RACs, weighted in 1985 proportions, is + 0.035; for 6-cylinder non-RACs, it is +0.016; for 8-cylinder engines it is negligible. Thus a slight correction to the general GPMR equation is warranted: a correction which is a function of cylinder count.

Table IV-37

Comparison of Road MPG and Adjusted EPA MPG, Non-Modal Adjustment System

Vehicle Technology	4-Cylinder			5-Cylinder			6-Cylinder			8-Cylinder		
	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG
RAC	25.2	20.4	20.2	--	--	--	20.5	16.9	16.8	17.8	14.8	14.8
RAI	24.4	22.1	21.3	--	--	--	20.7	20.7	17.7	18.0	15.0	15.0
RAD	28.6	26.2	25.4	26.1	23.2	23.5	29.0	27.3	25.8	25.0	22.2	22.7
RMC	28.1	24.4	23.6	--	--	--	21.4	18.9	18.6	17.3	15.8	15.3
RMI	25.5	24.2	23.5	--	--	--	21.4	20.0	20.0	--	--	--
RMD	29.7	28.1	28.0	--	--	--	--	--	--	--	--	--
FAC	27.3	23.5	22.9	--	--	--	22.8	19.2	18.6	18.5	14.4	14.7
FAI	25.8	24.2	23.7	21.1	19.5	18.9	--	--	--	16.8	13.4	13.5
FAD	--	--	--	--	--	--	--	--	--	24.9	20.9	21.5
FMC	31.9	29.0	27.7	--	--	--	24.6	21.6	21.1	--	--	--
FMI	30.1	28.9	28.8	25.0	24.4	23.4	--	--	--	--	--	--
FMD	43.9	42.0	40.7	32.4	30.3	31.1	--	--	--	--	--	--

The expression

$$\delta GPMR = 0.0085 (Ncyl - 8)$$

provides such a correction, changing the GPMR by -0.034 for Ncyl = 4 and by -0.017 for Ncyl = 6; it has no effect for Ncyl = 8.

Incorporating this correction in the general equation, we have the Non-Modal Master Equation:

$$\boxed{\begin{array}{c} GPMR = 1.097 + .0059(E) + .0085(N - 8) + FWD(-.185 + .03N) \\ + MAN(-.070) + INJ(-.184 + .0225N) + DSL(-.142) \end{array}}$$

where E = EPA 55/45 MPG

N = cylinder count

FWD = 1 if front drive, zero if rear drive

MAN = 1 if manual trans, zero if automatic

INJ = 1 if gasoline FI, zero if carb. or Diesel

DSL = 1 if Diesel, zero if carb. or gas FI

This Master Equation produces an average MPG error of less than 0.1 MPG. Table IV-38 compares, by cylinder count, the average MPG errors for no adjustment, for the original general equation, and for the Master Equation given above.

Table IV-38

Average MPG Error, Non-modal

Vehicle Type	Unadjusted MPG Error	1st General Eqn. MPG Error	Master Equation MPG Error
4-cylinder	+3.1	-0.8	-0.02
6-cylinder	+2.7	-0.5	-0.17
8-cylinder	+2.8	+0.04	+0.04
Overall	+2.9	-0.6	-0.06

E. ADJUSTMENT ALGORITHM DEVELOPMENTS...BI-MODAL

Analysis

Bi-modal analysis differs from non-modal analysis in four ways:

1) Some method must be used to define a "city-driven" car and a "highway-driven" car; this forced dichotomization permits comparison of the on-road fuel economy experience of the "city" cars against the EPA City MPG, and likewise with the "highway" cars.

2) Whichever metric in the data which categorizes "cityness" of driving is not usually present in all of the data records (example-some entire data sources lack estimates of city driving fraction), so those records without that metric must be discarded.

3) Even data records which do have the desired metric will not all have values of the metric satisfactory to a clearly "city" or "highway" categorization (e.g. 50% city driving fraction); either such records must also be discarded, leaving only the "purely-modally-extreme" cars, or some method must be employed to keep and use more of the data records.

4) Model type data cannot be used, because model type collapsing smears all of the categorization metrics together, destroying their power to segregate data records into the designated modal bins;

It has become more or less customary in bi-modal analysis to make use of estimated city driving fraction as a single cityness categorization metric, albeit frequently accompanied by some degree of discomfort about reliance on such a perceived quantity. An excellent report* on the subject of cityness categorization makes a persuasive case for consideration of other quantites (e.g. average miles per day (AMPD), population density (POPDENS)) as complements to — or even replacements for — city fraction.

---

* Urban/Highway Split: A Gray Area, by H.T. McAdams, Falcon Research and Development Co., Working Paper No. 3 of Argonne Program, November, 1981.

In the analysis herein, we considered AMPD and POPDENS in this context. Upon closer examination, problems with the accuracy of the POPDENS data were found, leading to rejection of it as a cityness categorization aid.

Taking a closer look at the EPA "City" and "Highway" values, the dichotomy which they represent (and the dichotomy to which we are forced to relate) embodies more than just "cityness" as reflected by things like average speed, stops per mile, etc. The most obvious of these is state of warmup of the vehicle. Indeed, the EPA City/Highway dichotomy is more properly viewed as a low MPG/high MPG dichotomy.

AMPD is of definite relevance to low MPG/high MPG categorization, and exists in a reasonable fraction of the data. In fact, slightly more of the data have AMPD values than have city fraction. It complements city fraction in that it tells us something of the vehicle's state of warmup, which city fraction does not even hint at. For example, a vehicle whose owner perceives to have a "low city fraction" could quickly be assigned to the "high MPG car" bin; but if it is driven an average of only two miles per day, such a categorization may be questionable.

It was therefore decided to use city fraction and AMPD for the low MPG/high MPG categorization. Data records with both city fraction and AMPD (some 13,000) were extracted for use as the low MPG/high MPG data set. After considering several options for use of the two categorization metrics, we chose the (admittedly simple) distributional intersection method for categorizing low MPG/high MPG vehicle subpopulations. The distribution of city fraction has tercile cuts at 39% and 74% *; the AMPD distribution has tercile cuts at 26 and 43 miles per day. The union of the high city fraction and low AMPD terciles was defined as encompassing "low MPG" cars, and the union of the low city fraction and high AMPD terciles was defined as encompassing "high MPG" cars. Recognizing that low MPG cars are to be

---

* One-third of the city fraction values are below 39%, 1/3 are between 39% and 74%, and 1/3 are above 74%.

related to the EPA low-MPG (City) number and the high MPG cars to the EPA high MPG (Highway) number, our nomenclature at this point bows to the pressure of convention and returns to labels of "city cars" and "highway cars". The city cars (those to be analyzed against EPA City MPG) are cars with high city fractions and low AMPD. Highway cars (those to be analyzed against EPA Highway MPG) are cars with low city fraction and high AMPD).

To drive home point (3) above about bi-modal categorization decimating the data base, observe that the above scheme produced 1420 bona fide city cars and 1353 highway cars, leaving about 10,000 cars uncategorizable. No more need be said on the necessity of employing a data retention technique.

The city car set had a city fraction average of 88%, and an AMPD average of 17 miles per day. The highway car set had a city fraction average of 16% and an AMPD average of 96 miles per day.

A fine method of using all the data in a bi-modal analysis is discussed in the EEA report.* This method is not appropriate in the current context, however, because it involves only city fraction and not AMPD. The method used herein first imputed a road city MPG number and a road highway MPG number using the single overall road MPG, the city fraction and the EPA highway-to-city MPG ratio. For cars with 100% city fraction, the achieved road MPG value was assigned as road city MPG; for cars with 0% city fraction, the acheived road MPG value was assigned as road highway MPG; for cars with intermediate city fractions, the EPA H/C ratio was used with the standard harmonic weighting formula to impute both road city and road highway MPG values keyed off the achieved road MPG number.

Derived from

$$R = \left[\frac{CFRAC/100}{R_c} + \frac{1-CFRAC/100}{R_h} \right]^{-1}$$

and

assumed $R_h/R_c = E_h/E_c = H/C$,

---

* Op. Cit. Development of Adjustment Factors ....

The imputed road city and highway MPG values R_c and R_h are:

$$R_c = R\left[\frac{CFRAC}{100} + \frac{1-CFRAC/100}{H/C}\right]$$

$$R_h = R_c \times H/C$$

Using assumed numbers $E_c = 20$ MPG, $E_h = 28$ MPG, H/C then = 1.40, $E_o = 23$ MPG, R = 19 MPG, CFRAC = 60%:

$$R_c = 16.8 \text{ MPG}$$

$$R_h = 23.5 \text{ MPG}$$

Since the city fraction analysis drives the overall road value to either a city value (CF = 100%) or a highway value (CF = 0%) continued inclusion of CFRAC in the following analysis is appropriate.

Next, city and highway GPM ratios were calculated from the EPA City and Highway MPG values and these imputed road city and highway MPG numbers. These GPM ratios were multiple-regressed against city fraction and AMPD and the appropriate EPA MPG value. Taking no chances with aggregation, these multiple regressions were performed on each separate Tech/Ncyl stratum. The resulting family of multiple regression equations permits us then to develop arrays of either constant city and highway GPM ratios or MPG-dependent city and highway GPMR algorithms (or both), representing the entire 13,000-car multi-modal source dataset -- not merely the 2800 cars in the "truly-extreme" subsets.

Surely an illustration is in order. For 2610 6-cylinder RAC vehicles in the overall dataset, the two multiple regression equations are:

$$\mathrm{CGPMR} = 0.867 - .00173(\mathrm{CFRAC}) - .00084(\mathrm{AMPD}) + .0266(\mathrm{Ec})$$

and

$$\mathrm{HGPMR} = 0.774 - .00171(\mathrm{CFRAC}) - .00086(\mathrm{AMPD}) + .0230(\mathrm{Eh})$$

From these, we can have MPG-dependent algorithms:

$$\mathrm{CGPMR} = 0.701 + .0266(\mathrm{Ec})$$

by solving with
CFRAC = 88, AMPD = 17

and

$$\mathrm{HGPMR} = 0.664 + .0230(\mathrm{Eh})$$

by solving with
CFRAC = 16, AMPD = 96

or, if preferred, we can have constant factors:

$$\mathrm{CGPMR} = 1.208$$

by solving with
Ec = 19.1, the mean Ec
of the 6RACs

and

$$\mathrm{HGPMR} = 1.264$$

by solving with
Eh = 26.1, the mean Eh
of the 6RACs.

Bi-Modal Analysis using the Non-Modal Method - Using Tech/Ncyl average city and highway GPMRs from the multiple regression solutions, a bi-modal analysis exactly identical to the non-modal analysis method was performed.

As with the non-modal analysis, the first step was to arrive at the natural MPG-dependence GPMR equations for RAC vehicles. This is shown in figure IV-28. The RAC city GPMR shows an MPG dependence slope of 0.0133 (compare to the earlier non-modal slope of 0.0059). The RAC highway GPMR has no statistically significant MPG dependence.

The Tech/NCyl city GPMR centroids are listed in Table IV-39, and in figures IV-29 through IV-31 for 4-cylinder, 5- and 6-cylinder, and 8-cylinder groups. The highway GPMR counterparts to these are listed in Table IV-40 and plotted in figures IV-32 through IV-34. These figures show dramatic differences in road fuel economy offset among the Tech/Ncyl groups, as was found in the non-modal analysis. Highway GPMRs are generally higher than city GPMRs, the only exceptions being RAD4, FAI4, FMC6 and RAI8.

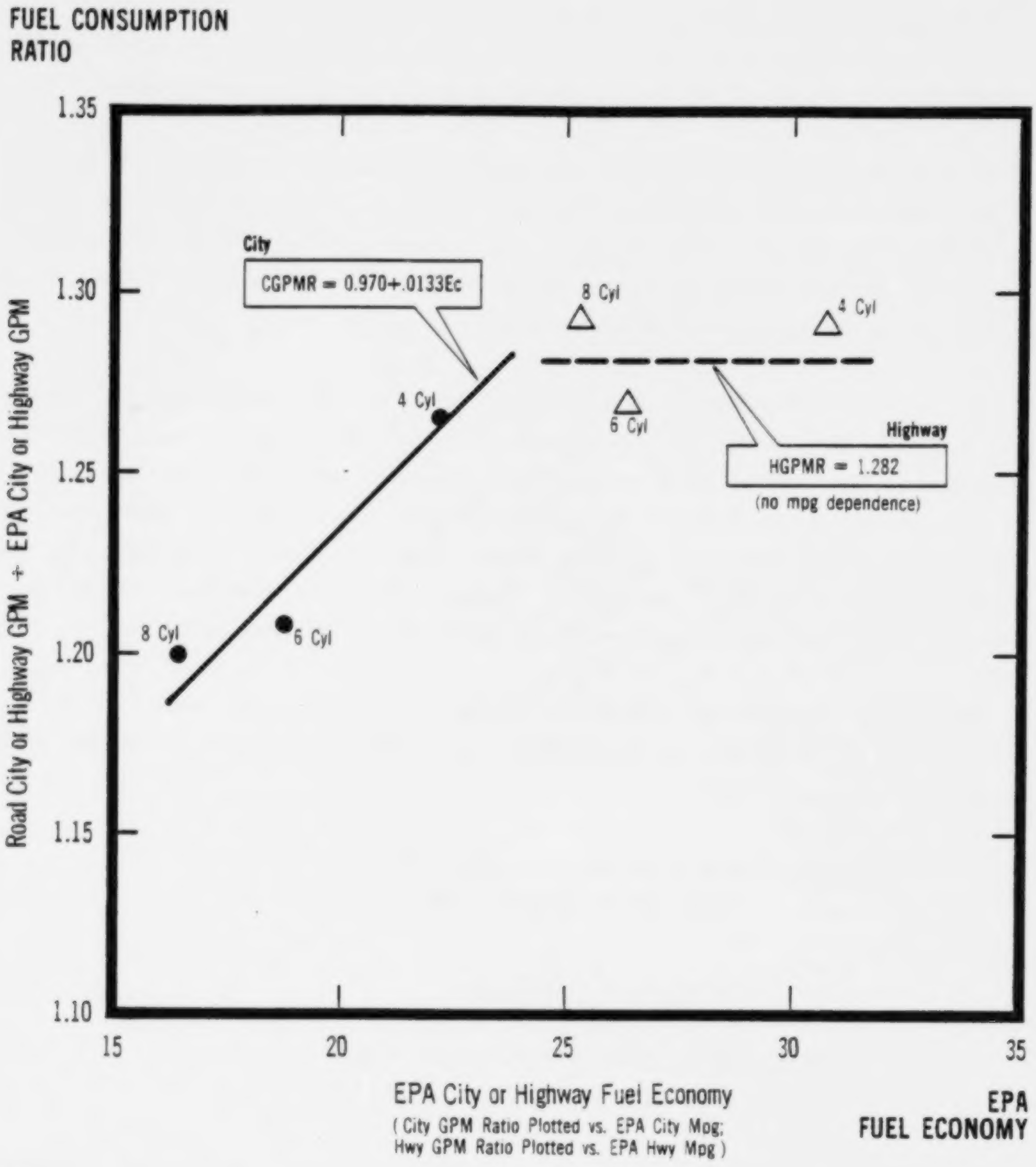
Proceeding through the Non-modal method's point-to-point analysis of the Ncyl-dependent effect of technology upon GPM ratio, the following GPMR general equations result:

$$\begin{aligned} \mathrm{CGPRM} = {} & 0.970 + .0133(E_c) + \mathrm{FWD}(-.268 + .0370N) + \mathrm{MAN}(-.100) \\ & + \mathrm{INJ}(-.124 + .0125N) + \mathrm{DSL}(-.198) \end{aligned}$$

and

$$\begin{aligned} \mathrm{HGPMR} = {} & 1.282 + \mathrm{FWD}(-.095 + .0121N) + \mathrm{MAN}(-.008) \\ & + \mathrm{INJ}(-.226 + .0205N) + \mathrm{DSL}(-.324 + .0429N) \end{aligned}$$

As in the non-modal analysis, the average adjusted MPG values were compared to actual road MPG values for the Tech/Ncyl groups. Also similar to the non-modal analysis were the findings that these general equations reduce average label error to less than one MPG, and that vernier corrections to the general equations could further improve their performance.



Figure

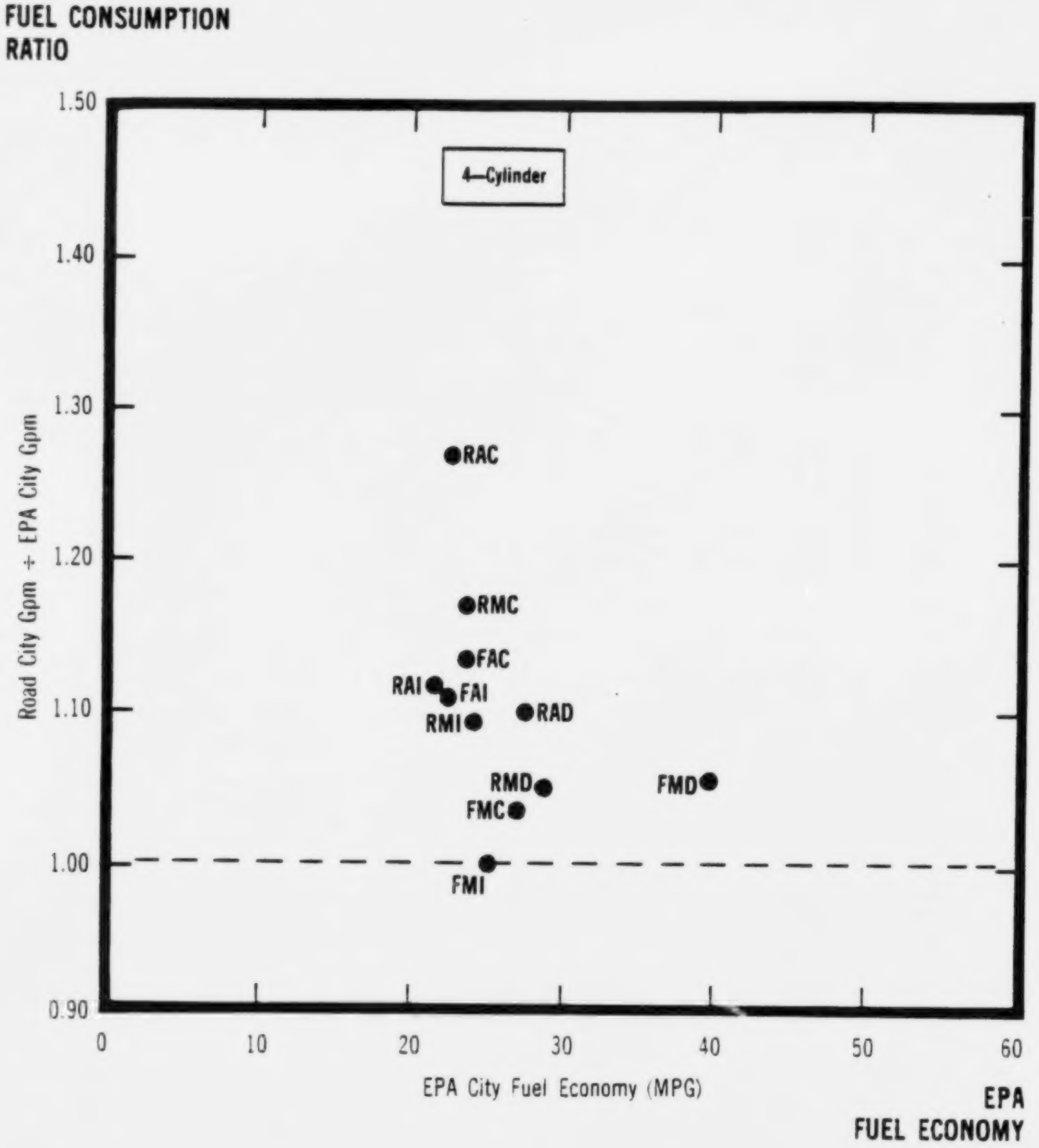
IV—28

"Natural Mpg Dependence" for RAC Vehicles, City and Highway Modes

Table IV-39

Average EPA City MPG and Road City GPM Ratio, by Technology and Cylinder Count

Vehicle Technology	4-Cylinder		5-Cylinder		6-Cylinder		8-Cylinder	
	EPA MPG	Actu GPMR	EPA MPG	Actu GPMR	EPA MPG	Actu GPMR	EPA MPG	Actu GPMR
RAC	22.1	1.266	--	---	19.1	1.208	16.4	1.199
RAI	21.6	1.117			18.5	1.070	16.6	1.244
RAD	27.4	1.101	23.5	1.067	--	---	21.6	1.092
RMC	23.4	1.170	--	---	20.3	1.120	--	---
RMI	24.0	1.090	--	---	19.6	1.073	--	---
RMD	28.6	1.039	--	---	--	---	--	---
FAC	23.3	1.133	--	---	19.9	1.197	15.7	1.248
FAI	22.6	1.109	17.4	1.023	--	---	14.0	1.162
FAD	--	---	--	---	--	---	21.4	1.119
FMC	26.7	1.032	--	---	20.1	1.114	--	---
FMI	25.0	0.995	21.9	0.938	--	---	--	---
FMD	39.4	1.054	--	---	--	---	--	---



Figure

IV—29

Technology Specific Average City GPM Ratios—Vehicles with 4-Cylinder Engines

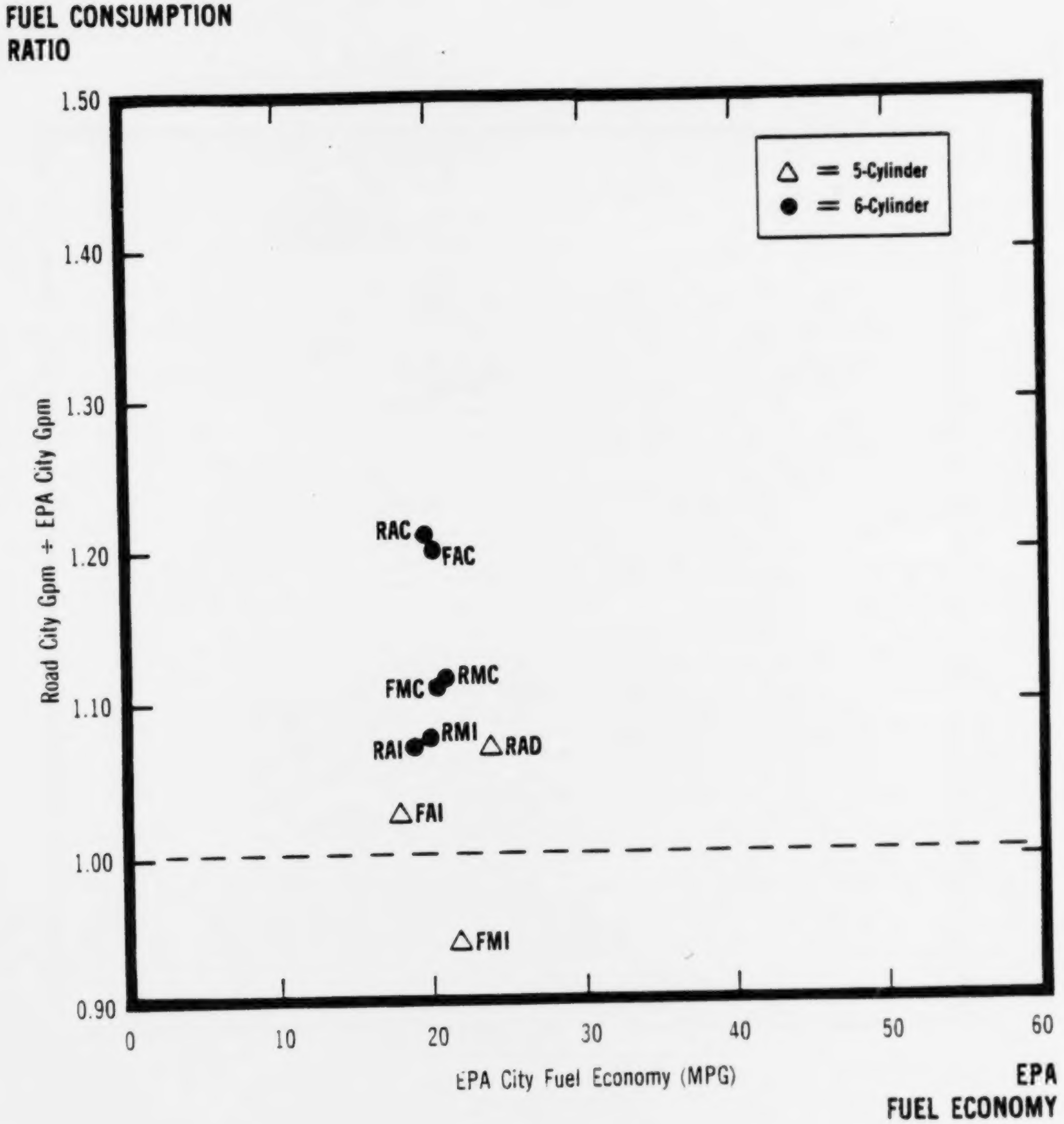


Figure
IV—30 Technology Specific Average City GPM Ratios—Vehicles with 5— or 6—Cylinder Engines

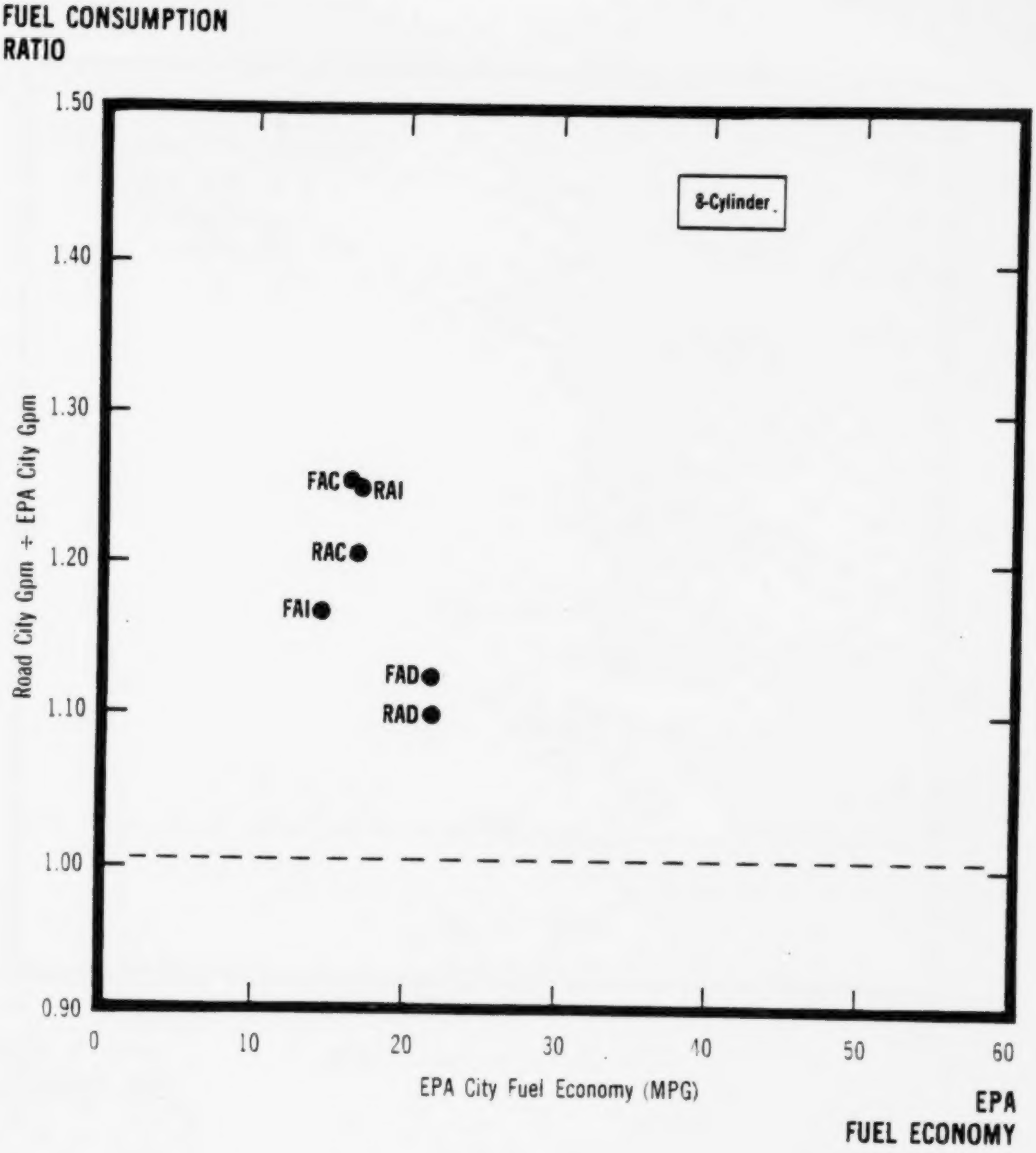


Figure
IV—31

Technology Specific Average City
GPM Ratios—Vehicles with 8—Cylinder Engines

Table IV-40

Average EPA Highway MPG and Road Highway GPM Ratio, by Technology and Cylinder Count

Vehicle Technology	4-Cylinder EPA MPG	4-Cylinder Actu GPMR	5-Cylinder EPA MPG	5-Cylinder Actu GPMR	6-Cylinder EPA MPG	6-Cylinder Actu GPMR	8-Cylinder EPA MPG	8-Cylinder Actu GPMR
RAC	30.7	1.290	--	---	26.1	1.264	25.2	1.291
RAI	27.6	1.125			23.7	1.078	24.0	1.231
RAD	30.8	1.091	29.7	1.187	--	---	32.7	1.225
RMC	36.2	1.336	--	---	29.1	1.241	--	---
RMI	34.9	1.096	--	---	29.6	1.147	--	---
RMD	34.2	1.076	--	---	--	---	--	---
FAC	33.1	1.241	--	---	29.8	1.238	23.1	1.264
FAI	31.8	0.976	25.4	1.118	--	---	22.2	1.245
FAD	--	---	--	---	--	---	32.2	1.359
FMC	38.1	1.147	--	---	33.9	1.047	--	---
FMI	38.7	1.138	33.8	1.055	--	---	--	---
FMD	51.7	1.106	--	---	--	---	--	---

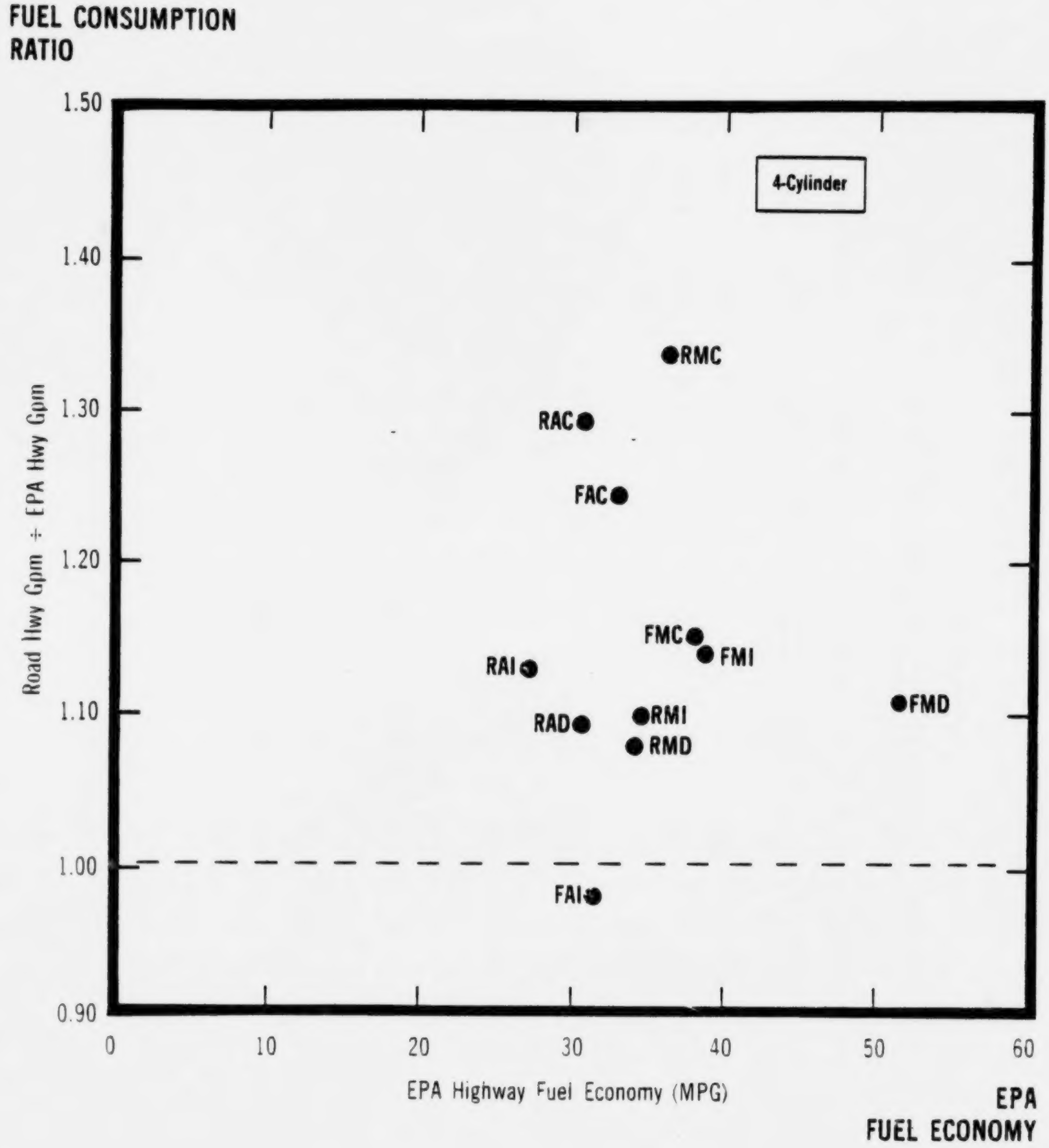


Figure
IV—32

Technology Specific Highway GPM Ratios— Vehicles with 4—Cylinder Engines

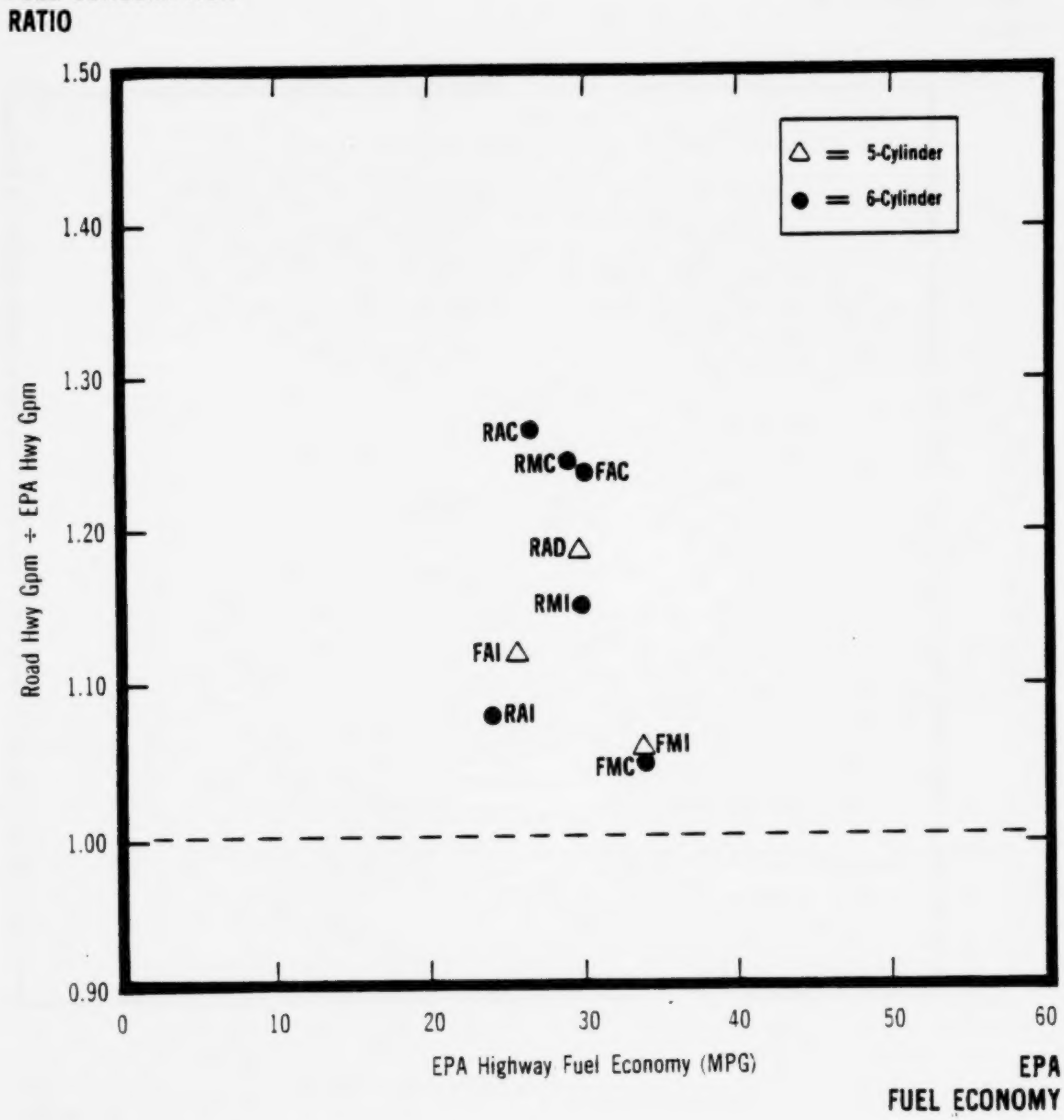


Figure
IV—33

Technology Specific Highway GPM Ratios— Vehicles with 5— or 6—Cylinder Engines

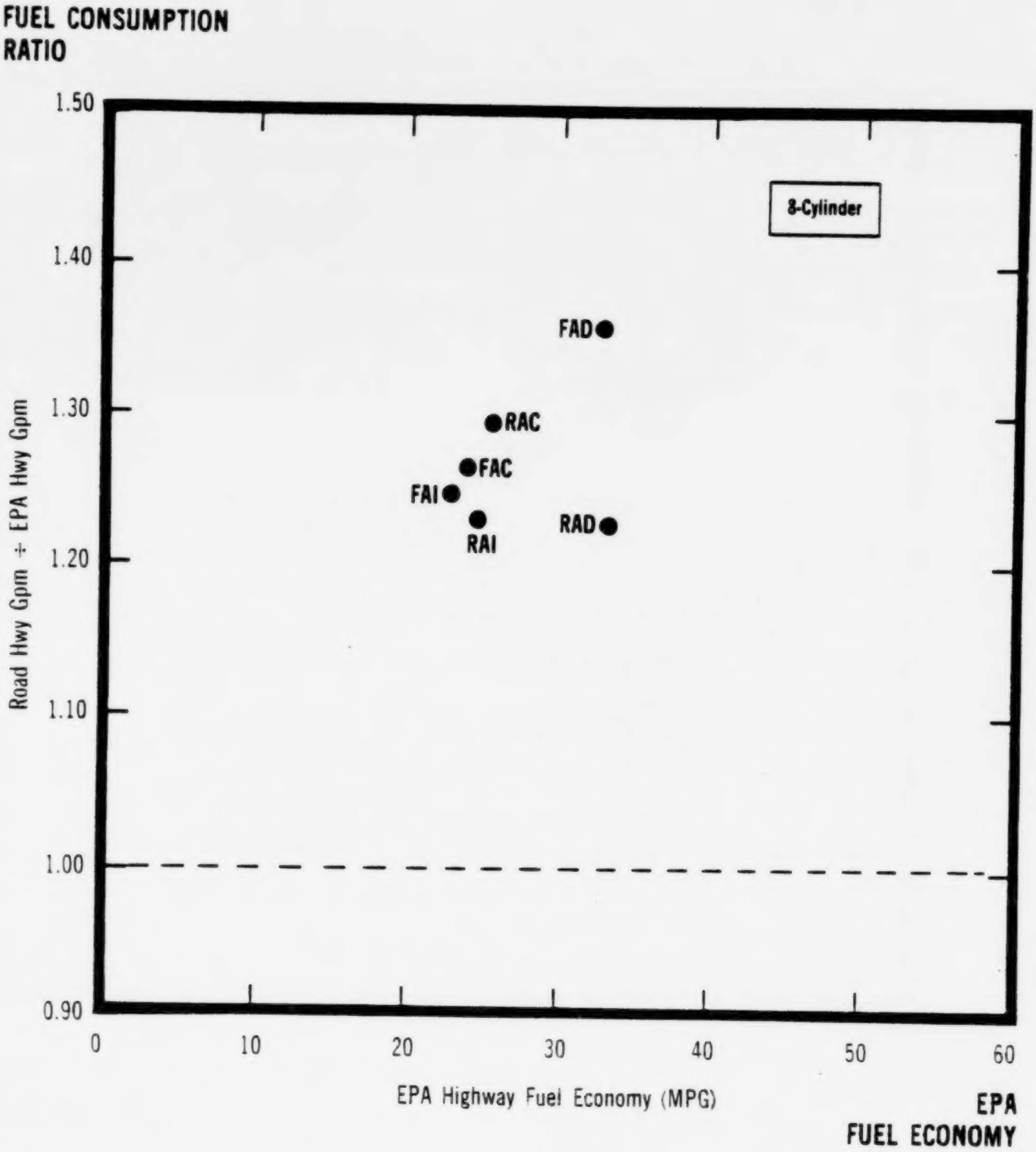


Figure
IV—34

Technology Specific Highway
GPM Ratios—Vehicles with 8—Cylinder Engines

The vernier correction for the CGPMR equation is the expression (0.0175)(Ncyl - 6), and the vernier correction for the HGPMR is the quantity -0.025, an Ncyl-independent correction. Thus the Bi-Modal Master Equations (Non-modal Method) are:

$$\boxed{\begin{aligned} CGPMR = {} & 0.970 + .0133(E_c) + .0175(N - 6) + FWD(-.268 + .0370N) \\ & + MAN(-.100) + INJ(-.124 + .0125N) + DSL(-.198) \end{aligned}}$$

and

$$\boxed{\begin{aligned} HGPMR = {} & 1.257 + FWD(-.095 + .0121N) + MAN(-.008) \\ & + INJ(-.226 + .0205N) + DSL(-.324 + .0429N) \end{aligned}}$$

Table IV-41 shows the EPA and Road City MPG figures and those calculated by the above CGPMR equation. While the current EPA City figure is erroneously high by an average of 2.3 MPG (using projected 1985 technology proportions), the average error from the final Master City Equation is virtually zero.

Table IV-42 is the same kind of table as IV-41. It shows how an average overlabeling figure of 5.1 MPG has been eliminated by the Master Highway Equation.

A Second Method of Bi-Modal Analysis - The 13,000-car data set used for development of the above bi-modal GPMR equations is less than one-third of the total 43,000-car data base used for the non-modal analysis. Since the 13,000-car subset is not necessarily a perfect microcosm of the entire data base, there are sometimes inconsistencies between the GPMR values from the Non-Modal Master Equation and those from the Bi-Modal Master Equations above*. None of these inconsistencies are serious, but they do violate the mathematical necessity — proven in Appendix D — that for any given vehicle type the non-modal GPMR must be in the range between the two bi-modal GPMR figures.

---

* For example, the Non-Modal GPMR for 6-cylinder RAI vehicles is 1.170 (at 20.5 EPA MPG), while the Bi-Modal GPMR values are 1.070 City (at 19.1 EPA City MPG) and 1.078 Highway (at 23.7 EPA Highway MPG).

Table IV-41

Comparison of EPA City MPG, Road City MPG, and Adjusted EPA City MPG using Bi-Modal Master CGPMR Equation #1 (Non-Modal Method)

Vehicle Technology	..... 4-Cylinder			..... 5-Cylinder			..... 6-Cylinder			..... 8-Cylinder		
	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG
RAC	22.1	17.4	18.0	--	--	--	19.1	15.8	15.6	16.4	13.7	13.2
RAI	21.6	19.3	18.8	--	--	--	18.5	17.3	15.8	16.6	13.3	13.8
RAD	27.4	24.9	24.9	23.5	22.1	22.1	--	--	--	21.6	19.8	19.7
RMC	23.4	20.0	20.4	--	--	--	20.3	18.1	17.8	--	--	--
RMI	24.0	21.1	22.2	--	--	--	19.6	18.3	18.1	--	--	--
RMD	28.6	27.5	28.1	--	--	--	--	--	--	--	--	--
FAC	23.3	20.5	20.7	--	--	--	19.9	16.6	16.8	15.7	12.6	12.7
FAI	22.6	20.3	21.7	17.4	17.0	16.8	--	--	--	14.0	12.0	11.7
FAD	--	--	--	--	--	--	--	--	--	21.4	19.1	19.1
FMC	26.7	25.9	25.0	--	--	--	20.1	18.0	18.4	--	--	--
FMI	25.0	25.1	25.7	21.9	23.3	22.0	--	--	--	--	--	--
FMD	39.4	37.4	37.8	--	--	--	--	--	--	--	--	--
Label Error (No Adjustmt)		+2.2 MPG			+0.4 MPG			+2.7 MPG			+2.6 MPG	
Label Error (1st Adjustmt)		-0.5 MPG			-0.7 MPG			-0.1 MPG			+0.5 MPG	
Label Error (Add Vernier)		+0.03 MPG			-0.2 MPG			-0.1 MPG			-0.1 MPG	

Table IV-42

Comparison of EPA Highway MPG, Road Highway MPG, and Adjusted EPA Highway MPG using Bi-Modal Master HGPMR Equation #1 (Non-Modal Method)

	..... 4-Cylinder			..... 5-Cylinder			..... 6-Cylinder			..... 8-Cylinder		
Vehicle Technology	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG
RAC	30.7	23.3	24.4	--	--	--	26.1	20.6	20.7	25.2	19.5	20.0
RAI	27.6	24.5	24.8	--	--	--	23.7	21.9	20.5	24.0	19.5	20.1
RAD	30.8	28.2	27.8	29.7	25.0	25.9	--	--	--	32.7	26.7	25.6
RMC	36.2	27.1	29.0	--	--	--	29.1	23.5	23.3	--	--	--
RMI	34.9	31.7	31.6	--	--	--	29.6	25.8	25.8	--	--	--
RMD	34.2	31.8	31.2	--	--	--	--	--	--	--	--	--
FAC	33.1	26.6	27.3	--	--	--	29.8	24.0	24.1	23.1	18.3	18.3
FAI	31.8	32.5	29.8	25.4	22.7	23.2	--	--	--	22.2	17.9	18.6
FAD	--	--	--	--	--	--	--	--	--	32.2	23.7	25.2
FMC	38.1	33.2	31.7	--	--	--	33.9	32.4	27.7	--	--	--
FMI	38.7	34.0	36.6	33.8	32.0	31.0	--	--	--	--	--	--
FMD	51.7	46.8	46.8	--	--	--	--	--	--	--	--	--
Label Error (No Adjustmt)		+5.3 MPG			+3.2 MPG			+4.7 MPG			+5.4 MPG	
Label Error (1st Adjustmt)		-0.7 MPG			-0.2 MPG			-0.6 MPG			-0.1 MPG	
Label Error (Add Vernier)		-0.1 MPG			+0.4 MPG			-0.7 MPG			+0.2 MPG	

Thus an alternate approach to bi-modal analysis is to take each Tech/Ncyl group's non-modal GPMR value as a better truth (since it comes from the whole 43,000 car data base), and calculate City and Highway GPMR values referenced to these non-modal figures.

This was done by first finding the difference between each Tech/Ncyl group's actual (not calculated) HGPMR and CGPMR. Table IV-43 lists these differences.

Table IV-43

Difference between Actual Highway GPMR
and City GPMR, by Technology and Cylinder Count
(CGPMR subtracted from HGPMR)

Technology	4-cylinder	5-cylinder	6-cylinder	8-cylinder
RAC	.024*	-	.056	.092
RAI	.008	-	.008	-.013
RAD	-.010	.120	-	.133
RMC	.166	-	.121	-
RMI	.006	-	.074	-
RMD	.037	-	—	-
FAC	.108	-	.041	.016
FAI	-.133	.095	-	.083
FAD	-	-	-	.240
FMC	.115	-	-.067	-
FMI	.143	.117	-	-
FMD	.052	-	-	-

---

* HGPMR = 1.290; CGPMR = 1.266; difference = 0.024, etc.

This ΔGPMR is a metric which can be analyzed for Tech/Ncyl dependency in exactly the same fashion as GPM ratios themselves were analyzed previously. Doing this, expressions for this ΔGPMR result as follows, referenced as usual to RAC technology as the base case:

$$\Delta GPMR_{FWD} = 0.013$$

$$\Delta GPMR_{MAN} = 0.219 - .0347N$$

$$\Delta GPMR_{INJ} = -0.044$$

$$\Delta GPMR_{DSL} = -0.251 + .0468N$$

The FWD and INJ expressions are independent of cylinder count: both have slopes of about 0.007 and regression R-values of about 0.13.

Now, since these expressions relate the ΔGPMR difference for non-RAC vehicles to that of RAC vehicles, we can develop algorithms for CGPMR and HGPMR once two things are established: CGPMR and HGPMR equations for RACs, and the connection between these and the non-RAC ΔGPMR equations.

Reviewing the previously established general GPMR equations,

$GPMR_{RAC} = 1.097 + .0059(E)$ Non-modal

$CGPMR_{RAC} = 0.970 + .0133(E)$ Bi-Modal #1

$HGPMR_{RAC} = 1.282$ Bi-Modal #1

Since the RAC bi-modal equations came from the 13,000-car subset, they are not reconciled with the RAC non-modal equation. There are an infinite number of ways to calculate reconciled bi-modal equations using the above, but we chose to retain the relation HGPMR = 1.282 and algebraically derive a CGPMR expression.*

---

* Vernier correction at the end of the process will take care of any error due to this choice.

The solution CGPMR expression, which does produce CGPMR values consistent with the non-modal equation and with HGPMR = 1.282, is:

$$\text{CGPMR}_{\text{RAC}} = \left[1.097 - \frac{0.152}{\text{H/C}}\right] + .0107(E_c)$$

Since this is specifically applicable to RAC vehicles, whose H/C values average 1.43 overall (1.39 for 4-cyl, 1.37 for 6-cyl, 1.53 for 8-cyl), and the term in brackets is not very sensitive to H/C variation*, we solve at H/C = 1.43 to obtain

$$\text{CGPMR}_{\text{RAC}} = 0.991 + .0107(E_c)$$

Now the connection between an HGPMR-CGPMR difference and a non-modal GPMR (referring again to Appendix D) is approximately

$$\text{HGPMR} = \text{GPMR} + 2/3(\text{HGPMR} - \text{CGPMR})$$

and

$$\text{CGPMR} = \text{GPMR} - 1/3(\text{HGPMR}-\text{CGPMR})$$

Folding all of this together, the CGPMR expression using this method is developed from:

$$\text{CGPMR} = .991 + .0107(E_c) + \Delta G(\text{Tech},\text{Ncyl})_{\text{non-modal}} - 1/3\,\Delta \text{GHC}(\text{Tech, Ncyl})_{\text{this method}}$$

where $\Delta G(\text{Tech, Ncyl})_{\text{non-modal}}$ represents the non-RAC terms in the non-modal GPMR equation and $\Delta \text{GHC}(\text{Tech, Ncyl})_{\text{this method}}$ represents the non-RAC HGPMR-CGPMR difference terms developed in this method.

---

* for H/C = 1.37, the bracket term is 0.986; for H/C = 1.53, it is 0.998.

The ΔG and ΔGHC terms are:

	ΔG	ΔGHC
FWD	$-.185 + .0300N$	$-1/3(.013)$
MAN	$-.070$	$-1/3(.219 + .0347N)$
INJ	$-.184 + .0225N$	$-1/3(-.044)$
DSL	$-.142$	$-1/3(-.251 + .0468N)$

The CGPMR general equation is then:

$$\begin{aligned} CGPMR = {} & .991 + .0107(E_c) + FWD(-.189 + .030N) \\ & + MAN(-.143 + .0102N) + INJ(-.169 + .0225N) \\ & + DSL(-.058 - .0156N) \end{aligned}$$

Similarly, the HGPMR expression comes from:

$$\begin{aligned} HGPMR = {} & 1.282 + \Delta G(Tech,\ Ncyl)_{\text{non-modal}} \\ & + 2/3\,\Delta GHC(tech,\ Ncyl)_{\text{this method}} \end{aligned}$$

whose ΔG and ΔGHC terms are:

	ΔG	ΔGHC
FWD	$-.185 + .0300N$	$+ 2/3(.013)$
MAN	$- .070$	$+ 2/3(.219 + .0347N$
INJ	$-.184 + .0225N$	$+ 2/3(-.044)$
DSL	$- .142$	$+ 2/3(-.251 + .0468N)$

which produces the general HGPMR equation:

$$\begin{aligned} HGPMR = {} & 1.282 + FWD(-.176 + .0300N) + MAN(.076 - .0231N) \\ & + INJ(-.213 + .0225N) + DSL(-.309 + 0.312N) \end{aligned}$$

The performance of these equations is compared to the average Tech/Ncyl MPG values from the 13,000 car subset is tables IV-44 (city) and IV-45 (highway). The calculated MPG figures in these tables correspond to the above general equations with vernier correction terms incorporated, as follows:

$$\mathrm{CGPMR} = [\text{above}] + 0.016(N - 6.5)$$

$$\mathrm{HGPMR} = [\text{above}] - 0.024$$

Comparing Table IV-44 with the earlier Table IV-41, the adjusted city MPG values for the two bi-modal methods are quite similar. Comparing Table IV-45 with the earlier Table IV-42, similarity of the two methods' adjusted highway MPG values is also obvious.

Table IV-44

Comparison of EPA City MPG, Road City MPG, and Adjusted EPA City MPG
using Bi-Modal Master CGPMR Equation #2 (Delta-HC Method)

Vehicle Technology	..... 4-Cylinder			..... 5-Cylinder			..... 6-Cylinder			..... 8-Cylinder		
	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG
RAC	22.1	17.4	18.0	--	--	--	19.1	15.8	15.7	16.4	13.7	13.5
RAI	21.6	19.3	18.9	--	--	--	18.5	17.3	15.9	16.6	13.3	13.9
RAD	27.4	24.9	25.0	23.5	22.1	22.2	--	--	--	21.6	19.8	19.9
RMC	23.4	20.0	20.5	--	--	--	20.3	18.1	17.9	--	--	--
RMI	24.0	21.1	22.3	--	--	--	19.6	18.3	18.3	--	--	--
RMD	28.6	27.5	28.2	--	--	--	--	--	--	--	--	--
FAC	23.3	20.5	20.8	--	--	--	19.9	16.6	16.9	15.7	12.6	12.8
FAI	22.6	20.3	21.8	17.4	17.0	16.9	--	--	--	14.0	12.0	11.8
FAD	--	--	--	--	--	--	--	--	--	21.4	19.3	19.1
FMC	26.7	25.9	25.1	--	--	--	20.1	18.0	18.5	--	--	--
FMI	25.0	25.1	25.8	21.9	23.3	22.1	--	--	--	--	--	--
FMD	39.4	37.4	38.0	--	--	--	--	--	--	--	--	--
Label Error (No Adjustmt)		+2.2 MPG			+0.4 MPG			+2.7 MPG			+2.6 MPG	
Label Error (Adj + Vernier)		+0.16 MPG			-0.22 MPG			-0.04 MPG			+0.12 MPG	

Table IV-45

Comparison of EPA Highway MPG, Road Highway MPG, and Adjusted EPA Highway MPG using Bi-Modal Master HGPMR Equation #2 (Delta-HC Method)

Vehicle Technology	..... 4-Cylinder			..... 5-Cylinder			..... 6-Cylinder			..... 8-Cylinder		
	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG	EPA MPG	Actu MPG	Calc MPG
RAC	30.7	23.3	24.4	--	--	--	26.1	20.6	20.7	25.2	19.5	20.0
RAI	27.6	24.5	24.3	--	--	--	23.7	21.9	20.0	24.0	18.5	19.6
RAD	30.8	28.2	28.6	29.7	25.0	26.8	--	--	--	32.7	26.7	27.3
RMC	36.2	27.1	29.1	--	--	--	29.1	23.5	24.4	--	--	--
RMI	34.9	31.7	31.2	--	--	--	29.6	25.8	26.4	--	--	--
RMD	34.2	31.8	32.3	--	--	--	--	--	--	--	--	--
FAC	33.1	26.6	27.5	--	--	--	28.8	24.0	23.6	23.1	18.3	17.5
FAI	31.8	32.5	29.4	25.4	22.7	22.5	--	--	--	22.2	17.9	17.3
FAD	--	--	--	--	--	--	--	--	--	32.2	23.7	25.5
FMC	38.1	33.2	32.1	--	--	--	33.9	32.4	28.3	--	--	--
FMI	38.7	34.0	36.4	33.8	32.0	31.0	--	--	--	--	--	--
FMD	51.7	46.8	51.6	--	--	--	--	--	--	--	--	--
Label Error (No Adjustmt)	+5.3 MPG			+3.2 MPG			+4.7 MPG			+5.4 MPG		
Label Error (Adj + Vernier)	+0.10 MPG			+0.33 MPG			-0.63 MPG			+0.23 MPG		

This page intentionally
blank and un-numbered

V. EVALUATION OF CANDIDATE LABELING APPROACHES

A. METHODOLOGY

Each adjustment algorithm is an equation of the form:

$$L = f(E),$$

where L is the label fuel economy, and E is the corresponding EPA fuel economy. Each algorithm was evaluated by first constructing a test fleet which is representative of the fleet for which the adjustments will be used, and for which the on-road fuel economy, R, is known.

Next the quantity $D = L/R$ was constructed for the test fleet and displayed as a histogram. A perfect adjustment system would have $D = L/R = 1.0$ for each vehicle. The better the adjustment system, the closer the histogram is to a sharp peak at unity. Figures of merit are defined as follows:

PW10 = The percent of the vehicles for which the label MPG is within ± 10 percent of the Road MPG. The bigger PW10 is, the better.

CN10, CP10 = The centroids of the distribution on the Negative and Positive sides respectively, omitting the central ±10 percent slice. The closer to unity CN10 and CP10 are, the better, assuming that the distribution extends more than 10 percent on either side of unity.

PG10 = The percent of the distribution which is greater than the plus 10 percent cutpoint. The smaller PG10 is, the better.

PL10 = The percent of the distribution which is less than the minus 10 percent cutpoint. The smaller PL10 is, the better.

RC10 = The value of the quantity $[(CP10-1)(PG10)]/[(1-CN10)(PL10)]$. It corresponds to a weighted estimate of the "evenhandedness" of the distribution. The closer RC10 is to 1.0, the better.

PW10/PG10 = The ratio of the percent of the vehicles within the ± 10% cutpoints to the percent of vehicles labeled too high. The bigger this ratio is, the better.

1-PG10 = This statistic measures "percent not overlabeled".

Some mention should be made of the use of the ratio, L/R, as the appropriate statistic. The ratio is used because the fleet overall MPG is expected to increase in the future. Indeed, our future fleets are typically 7 to 8 MPG higher in average MPG than is today's fleet. A statistic using MPG differences becomes a more stringent test as average MPG goes up, implying that an improvement in GPMR prediction accuracy is needed as MPG increases. Actually, since the adjustments were developed from GPMR, the difference in MPG (at constant GPMR accuracy) should increase as MPG goes up. The use of the ratio, L/R, eliminates any problems that might be caused by the difference approach and a growing fleet average MPG.

B. TEST FLEETS

The test fleet should be one that is representative of the fleet of vehicles to which the adjustments are to be applied. It appears that the earliest fleet to which these adjustments could apply would be the 1984 model year fleet. Assuming that the adjustments will be used for a period of time before they are changed, a "mid-1980s" fleet is the fleet of interest. Obviously, this requires some extrapolation. In order to con- struct the fleet, we used a report* called the Delphi Forecast in this section.

From the cylinder-count number projections in the Delphi Forecast it can be seen that the bulk of the market is projected to be 4s and 6s. The Delphi Forecast projected about 55% 4-cylinder, 35% 6-cylinder, and 10% 8-cylinder for U.S. Produced cars. The fleet is also projected to be 15% Diesel. 70% of the fleet is projected to be transverse front wheel drive, with the automatic transmission/manual transmission split at 70/30.

---

* U.S. Automotive Industry in the 1980's: A Domestic and Worldwide Perspective: The Second Delphi Forecast - July 1981, by Arthur Anderson & Company, The Michigan Manufacturers Association, and the University of Michigan.

By adding to the Delphi Forecast figures our own figures on today's import fleet, an overall fleet weighted 79% U.S.-built and 21% imported was constructed. Its statistics are: 65% front wheel drive; 62% automatic transmission; 67% carbureted, 18% fuel injected, 15% Diesel; and 67% 4-cylinder, 25% 5- and 6-cylinder, and 8% 8-cylinder.

An overall test fleet was constructed meeting these proportions. Compared to today's fleet it has more 4-cylinder engine equipped cars, more manual transmission equipped cars, and more front wheel drive cars. Also, more cars have Diesel engines.

Test fleets representing "city-driven" and "highway driven" vehicles were similarly constructed.

Each of the three initial (as-is) test fleets had a distribution of technologies different from the future fleet projections. Each fleet was adjusted in technology mix to be more representative of the mid-1980s fleet, thus creating three additional fleets.

The "as is" and "technology-mixed" fleets are described in the following table. It can be seen that the fleets with adjusted technology mix are consistent with the mid-1980s projections.

Table V-1

Test Fleet Descriptions

Fleet	Number of Vehicles	Percent of Fleet							
		FWD	Auto Tran	Carb	FI	Dsl	4 Cyl	5&6 Cyl	8 Cyl
Overall-As Is	41,906	8	84	97	2	1	18	27	55
Overall-Technology Mix Adjusted	10,347	65	62	67	18	15	67	25	8
City-Driven As Is	12,664	15	77	92	6	2	31	27	42
City-Driven Technology Mix Adjusted	5,084	64	62	70	17	13	67	25	8
Highway-Driven As Is	12,666	15	77	92	6	2	31	27	42
Highway-Driven Technology Mix Adjusted	5,139	63	62	69	17	14	67	26	8

All three technology-adjusted fleets have properties which make them usable as test fleets for evaluating the different adjustment algorithms. They are all closer to a mid-1980s fleet than is today's fleet. The fleets are not to be taken as predictions of the future, merely tools to evaluate various labeling approaches. They are more appropriate than test fleets with today's mix. The city and the highway fleets consists of vehicles that are primarily city-driven and highway-driven, respectively. The fact that the fleets are not made up simply of vehicles with extreme values of city fraction (100 and zero) is also appropriate. The reason for this, explained in Section IV, is that both city fraction (CF) and average miles per day (AMPD) were used as joint indicators of city-driven or highway-driven cars. The analysis showed that a fleet with an average CF of 88 percent and an average AMPD of 17 was characteristic of city-driven cars, while an average CF of 16 percent and an average AMPD of 96 characterized highway-driven cars.

C. EVALUATION OF LABELING APPROACHES

The histogram-derived figures of merit can be used to compare and rank the various labeling approaches. For example, one can first sort on the figure of merit considered most important, and discard those labeling approaches that fall below an acceptable figure of merit. This sorting process can then be repeated with the next most important figure of merit, and so on, until the labeling approach which is the best is identified.

The histograms generated in this evaluation are shown in Appendix F; the evaluations of the adjustment algorithms are discussed below.

The Non-Modal Master equation is of the form

$$Eo/Ro = OM\ (Eo,\ tech,\ cyl)$$

This can be rewritten as a labeling algorithm by solving for Ro; ideally, the label value, Lo, should be equal to the road value.

$$Lo = \frac{Eo}{OM\ (Eo,\ tech,\ cyl)}$$

Since we have dual equations for the city and highway adjustments, four bi-modal labeling algorithms result:

$$Lc = \frac{Ec}{CM1\ (Ec,\ tech,\ cyl)},\quad Lc = \frac{Ec}{CM2\ (Ec,\ tech,\ cyl)}$$

$$Lh = \frac{Eh}{HM1\ (Eh,\ tech,\ cyl)},\quad Lh = \frac{Eh}{HM2\ (Eh,\ tech,\ cyl)}$$

The statistic $D = L/R$ can be generated several ways, depending on the candidate adjustment approach. (For today's unadjusted case, $Li = Ei$). There are historical values to reconsider, for example, the October 1980 EPA report* had simple MPG - independent adjustment factors. Consider the following values based on Table II p. 21 of that report.

0.90 Ec (city), 0.79 Eh (hwy) —— from the "All-3" Data Base

0.98 Ec (overall), 0.86 Eo (overall) ——— from the "All-3" Data Base

MPG-independent values similar to these historical values have been generated. For Non-Modal analysis, MPG factors from 0.85 to 0.89 can be calculated (p. IV-35). From the "All-3" data above, the value of 0.86 was previously derived. These can all be represented by a test of a factor of 0.87.

In a similar manner, values of 0.90 and 0.84 were developed as MPG-independent adjustments to the city MPG and highway MPG value, respectively. These are comparable to the 0.90 and 0.79 values above.

The following tables give some combinations that were evaluated as candidate labeling approaches.

---

* Technical Support for Regulatory Action - Light duty Vehicle Fuel Economy Labeling, EPA/AA/CTAB/FE-81-6

Table V-2*

Non-Modal Adjustments

Case	Statistic	Test Fleet	Comment
01	Lo(Eo)/Ro $Lo(Eo) = \frac{Eo}{OM\ (Eo,\ tech,\ cyl)}$	a. Overall-As Is b. Overall-Technology Adjusted	Non-Modal Master Equation.
02	Lo(Eo)/Ro $Lo(Eo) = Eo$	a. Overall-As Is b. Overall-Technology Adjusted	Non-Modal Today's Composite Case.
03	Lo(Eo)/Ro $Lo(Eo) = Ec$	a. Overall-As Is b. Overall-Technology Adjusted	Non-Modal, What EPA says is "estimated MPG".
04	Lo(Eo)/Ro $Lo(Eo) = 0.87\ Eo$	a. Overall-As Is b. Overall-Technology Adjusted	Current estimate of non-modal simple "factor".

---

* Histograms of the label error for each case appear in Appendix F.

Table V-3*

Bi-Modal Adjustments — City Cases

Case	Statistic	Test Fleet	Comment
C1	Lc(Ec)/Rc $Lc(Ec) = \frac{Ec}{CM1\ (Ec,\ tech,\ cyl)}$	a. City-As Is b. City-Technology Adjusted	Bi-Modal Master City equation #1.
C2	Lc(Ec)/Rc $Lc(Ec) = Ec$	a. City-As Is b. City-Technology Adjusted	Today's unadjusted city number tested on City cars.
C3	Lc(Ec)/Rc $Lc = \frac{Ec}{CM2\ (Ec,\ tech,\ cyl)}$	a. City-As Is b. City-Technology Adjusted	Bi-Modal Master City equation #2.
C4	Lc(Ec)/Rc $Lc(Ec) = \frac{Ec}{OM\ (Ec,\ tech,\ cyl)}$	a. City-As Is b. City-Technology Adjusted	Non-Modal Master Equation used to adjust Ec.
C5	Lc(Ec)/Rc $Lc(Ec) = 0.90\ Ec$	a. City-As Is b. City-Technology Adjusted	Current estimate of simple City "factor", applied to City cars.

---

* Histograms of the label error for each case appear in Appendix F.

Table V-4*

Bi-Modal Adjustments--Highway Cases

Case	Statistic	Test Fleet	Comment
H1	Lh(Eh)/Rh $Lh(Eh) = \frac{Eh}{HM1\ (Eh,\ tech,\ cyl)}$	a. Highway-As Is b. Highway-Technology Adjusted	Bi-Modal Master equation #1.
H2	Lh(Eh)/Rh $Lh(Eh) = Eh$	a. Highway-As Is b. Highway-Technology Adjusted	Unadjusted highway number tested on Highway cars; what advertising says.
H3	Lh(Eh)/Rh $Lh(Eh) = \frac{Eh}{HM2\ (Eh,\ tech,\ cyl)}$	a. Highway-As Is b. Highway-Technology Adjusted	Bi-Modal Master Highway equation # 2.
H4	Lh(Eh)/Rh $Lh(Eh) = \frac{Eh}{OM\ (Eh,\ tech,\ cyl)}$	a. Highway-As Is b. Highway-Technology Adjusted	Non-Modal Master Equation used to adjust Eh.
H5	Lh(Eh)/Rh $Lh(Eh) = 0.84\ Eh$	a. Highway-As Is b. Highway-Technology Adjusted	Current estimate of simple Highway "factor", applied to Highway cars.

---

* Histograms of the label error for each case appear in Appendix F.

The four candidate adjustment cases for the Non-Modal adjustment were examined first. The statistic PW10, the percent correctly labeled, is shown below:

Table V-5

PW10 Statistics-Non-Modal Fleets

Case	Overall As Is Fleet		Overall Technology-Adjusted Fleet	
	PW10	Rank	PW10	Rank
01a/01b	48%	1	56%	1
02a/02b	29%	4	39%	4
03a/03b	46%	3	51%	3
04a/04b	47%	2	52%	2

As indicated in Table IV-5, the current system (case 02) is clearly last. The other adjustments are better, with a slight edge for the overall master equation. It should be noted that as the technology mix approaches that of the mid-1980s projections, (the change from the as-is fleet to the adjusted fleet) the percent correctly labeled improves. For this case there is no rank reversal due to fleet differences.

For the four cases the following table of RC10, the weighted evenhandness statistic, was then evaluated.

Table V-6

RC10 Statistics-Non-Modal Fleets

Case	Overall As Is Fleet		Overall Technology-Adjusted Fleet	
	RC10	Rank	RC10	Rank
01a/01b	1.39	1	1.26	3
02a/02b	34.60	4	15.70	4
03a/03b	2.18	2	0.94	2
04a/04b	2.47	3	1.01	1

Table IV-6 shows that the RC10 statistic clearly identifies the current system (case 02) as the last in rank. Adjusting the technology mix results in some rank change along with an improvement in RC10 for all cases studied.

Another statistic of interest is the ratio PW10/PG10 where PG10 is the percent overlabeled. This statistic combines the good and bad of a labeling scheme, and also accentuates the difference between some labeling schemes. The bigger PW10/PG10, is, the better.

Table V-7

PW10/PG10 Statistics-Non-Modal Fleets

Case	Overall As Is Fleet		Overall Technology-Adjusted Fleet	
	PW10/PG10	Rank	PW10/PG10	Rank
01a/01b	1.80	1	2.58	1
02a/02b	0.44	4	0.72	4
03a/03b	1.42	2	2.48	3
04a/04b	1.40	3	2.50	2

The current system overlabels more cars than it labels correctly. All the other adjustments label correctly about 2.5 times as many cars as they overlabel. The ranks here did not change with the fleet mix.

The alternative statistic parallel to PW10 in meaning is the value 1-PG10. This is the percent not overlabeled ("correctly labeled" if the absence of overlabeling is defined as "correct").

Table V-8

1-PG10 Statistics-Non-Modal Fleets

Case	Overall As Is Fleet		Overall Technology-Adjusted Fleet	
	1-PG10	Rank	1-PG10	Rank
01a/01b	74%	1	79%	1T
02a/02b	33%	4	45%	4
03a/03b	67%	2T	79%	1T
04a/04b	67%	2T	79%	1T

Again the current system is last in rank with the 3 other cases being close to equal and all significantly better than the current system.

The city and highway labeling algorithms were evaluated similar to the foregoing. The results are shown in the following tables.

Table V-9

PW10 Statistics-City Fleets

Case	City As Is Fleet		City Technology-Adjusted Fleet	
	PW10	Rank	PW10	Rank
C1a/C1b	52%	1	54%	1T
C2a/C2b	22%	5	35%	5
C3a/C3b	50%	3	53%	3
C4a/C4b	51%	2	54%	1T
C5a/C5b	41%	4	51%	4

The trend seen before in the overall adjustment cases repeats itself. Labeling can be improved substantially over the current system by more than one approach. The rest of the statistics for the city and highway labeling approaches follow.

Table V-10

RC10 Statistics-City Fleets

Case	City As Is Fleet		City Technology-Adjusted Fleet	
	RC10	Rank	RC10	Rank
C1a/C1b	2.26	1	2.75	2T
C2a/C2b	57.50	5	23.29	5
C3a/C3b	3.75	3	3.13	4
C4a/C4b	3.22	2	2.75	2T
C5a/C5b	7.87	4	2.71	1

Table V-11

PW10/PG10-Statistics-City Fleets

Case	City As Is Fleet		City Technology-Adjusted Fleet	
	PW10/PG10	Rank	PW10/PG10	Rank
C1a/C1b	1.73	1	1.74	1T
C2a/C2b	0.29	5	0.57	5
C3a/C3b	1.39	3	1.67	3
C4a/C4b	1.50	2	1.73	1T
C5a/C5b	0.84	4	1.59	4

Table V-12

1-PG10 Statistics-City Fleets

Case	City As Is Fleet		City Technology-Adjusted Fleet	
	1-PG10	Rank	1-PG10	Rank
C1a/C1b	70%	1	69%	1T
C2a/C2b	25%	5	39%	5
C3a/C3b	64%	2T	68%	3T
C4a/C4b	64%	2T	69%	1T
C5a/C5b	51%	4	68%	3T

Table V-13

PW10 Statistics-Highway Fleets

Case	Highway As Is Fleet		Highway Technology-Adjusted Fleet	
	PW10	Rank	PW10	Rank
H1a/H1b	51%	2T	50%	2T
H2a/H2b	24%	5	34%	5
H3a/H3b	51%	2T	50%	2T
H4a/H4b	52%	1	52%	1
H5a/H5b	51%	2T	48%	4

Table V-14

RC10 Statistics-Highway Fleets

Case	Highway As Is Fleet		Highway Technology-Adjusted Fleet	
	RC10	Rank	RC10	Rank
H1a/H1b	0.72	3	0.48	4
H2a/H2b	43.90	5	10.05	5
H3a/H3b	0.74	2	0.55	2
H4a/H4b	0.99	1	0.66	1
H5a/H5b	1.68	4	0.53	3

Table V-15

PW10/PG10 Statistics-Highway Fleets

Case	Highway As Is Fleet		Highway Technology-Adjusted Fleet	
	PW10/PG10	Rank	PW10/PG10	Rank
H1a/H1b	1.62	4	3.33	1
H2a/H2b	0.34	5	0.59	5
H3a/H3b	2.69	1	3.13	2
H4a/H4b	2.41	2	2.98	3
H5a/H5b	1.83	3	2.90	4

Table V-16

1-PG10 Statistics-Highway Fleets

Case	Highway As Is Fleet		Highway Technology-Adjusted Fleet	
	1-PG10	Rank	1-PG10	Rank
H1a/H1b	69%	4	85%	1
H2a/H2b	27%	5	42%	5
H3a/H3b	81%	1	84%	2T
H4a/H4b	79%	2	82%	4
H5a/H5b	72%	3	84%	2T

The current system is clearly non-competitive with any of the adjustment systems: The current system is so deficient, any improvement seems attractive.

Further analysis, an unweighted rank analysis, was performed on the results in Tables V-5 through V-16.

For Non-Modal adjustment, the Overall Master equation was clearly the best. The results for the city and highway labels were not as clear cut: for the city case the City Master equation #1 and the Overall Master equations were the better candidates, while for the highway case the Highway Master equations #1 and #2 and the Overall Master equation were all essentially tied.

A weighted rank analysis was performed next, using the following weightings:

Most Important:	Percent Correctly Labeled	(PW10)
Second in Importance:	Percent Not OverLabeled	(1-PG10)
	More Correct Than Over-Labeled	(PW10/PG10)
Third in Importance:	Evenhandedness	(RC10)

This weighted analysis yielded a slight edge to the Overall Master Equation for City adjustment and did not resolve the issue among the three contending Highway algorithms.

Evaluation of the three contending highway adjustments on collapsed data also did not produce a clear choice, so other attributes of the Bi-Modal adjustments were considered. For each set of city and highway labels, a range inclusion statistic can be evaluated. This is the percent of vehicles whose overall Road MPG value falls between the City label value and the Highway label value. This is relevant in a bi-modal labeling scheme since drivers who mix city and highway driving could expect their Road MPG to fall between the two label values. When this analysis was performed the following results were obtained.

Table V-17

Range Inclusion Results

Adjustment System		Range Inclusion
Lc	Lh	Percent
OM(Ec)	OM(Eh)	71
CM1(Ec)	HM1(Eh)	68
CM2(Ec)	HM2(Eh)	69

The Non-Modal Master equation is seen to have an edge here, indicating that it deserves some careful consideration. (The current system has a 56% value for this metric, as a point of interest.)

Another concern in Bi-Modal labeling is the general palatability of having Highway Label MPG values be numerically greater than City Label MPG values. This is the second attribute examined for the contending Bi-Modal adjustments.

The test fleet chosen for this was the Overall Technology-Mix Adjusted fleet from Table V-1. For each of the three competing systems in Table V-17 the ratio of Highway Label MPG to City Label MPG was computed for each car. For the system using the Non-Modal Master equation, not once in 10,347 times did the ratio equal 1.0. This means the adjusted Highway Label MPG was always greater than the adjusted City Label MPG. In fact, the lowest ratio of Label Highway MPG to Label City MPG was 1.075. In contrast, the other two Bi-Modal adjustment Systems produced several instances of crossover (label Highway MPG lower than label City MPG).

D. CONCLUSION

On balance then, the Non-Modal Master equation is the Fuel Economy Label algorithm of choice for Bi-Modal labeling. It is superior to the current system in every metric examined, and performs better, all in all, than the other candidate Bi-Modal algorithms. Interestingly, this adjustment algorithm has the same functional form whether a one-number Label or a two-number Label is to be considered. For one-number labeling, this master equation is used with the EPA Composite, or "55/45" MPG figures. For two-number labeling, it is used once to adjust EPA City MPG values and once again to adjust EPA Highway MPG values.

This page intentionally
blank and un-numbered

VI. ACKNOWLEDGMENTS

This report was prepared by a team of analysts, writers, programmers, and typists. Their names are listed below. They must be credited with a significant addition to the understanding of EPA-to-Road MPG differences.

J.P. Cheng
D. Curtis
J.A. Foster
R.M. Heavenrich, Jr.
K.H. Hellman
S.L. Jarvis
E.I. LeBaron
S.L. Loos
J.D. Murrell

Annotated List of Appendixes

Appendix A (5 pages) : this explains and illustrates the computation of the Influence Index, a metric which quantifies the fuel consumption effect of a combination of real-world influences. The Influence Index can normalize actual GPM Ratios in on-road data to null out effects of differential usage and exposure between vehicle types. In this report, the Influence Index was not used as such a normalizer but only as a tool for screening data for outliers. It needs further refinement before it should be considered for functional usage.

Appendix B (72 pages) : this is a compilation of analyses of the separate data sources. In addition to the first-level (all model years) analyses that appeared in Section IV, this appendix gives separate analyses for each model year within each data source; it also gives Influence Index data for those sources with enough parameters covered (e.g., temperature, AMPD) to permit Influence Index computation.

Appendix C (34 pages) : this analysis compares perceived-MPG data and fleet data against measured-MPG consumer data. It was part of the basis for deciding which data types to use in development of fuel economy adjustment systems.

Appendix D (4 pages) : this short appendix is a mathematical proof of a relationship between non-modal and bi-modal GPM Ratios. It is related to one of the bi-modal adjustment schemes in Section IV.

Appendix E (37 pages) : this is a listing of the model type data base into which the entire 52,780-car data base was collapsed. There are three tables following the format for the listing: Table E-1, -2, and -3 list the data in three groups: consumer-measured MPG, fleet-measured annualized MPG, and consumer-perceived MPG. Each line in a given data table is the aggregation of all individual car data for a specific model year/model type. The "number of observations" column indicates how many vehicle data points the line represents, except when that number is 30 or more the number of cars represented could be much greater than 30. (see text, page IV-1.)

Appendix F (32 pages) : this is the set of histograms of the ratio of label MPG to road MPG, for the adjustment schemes evaluated in Section V. The adjustment being tested and the test fleet it was tested on are identified for each histogram.

ANLOA-1

This page intentionally
blank and un-numbered

APPENDIX A

FUEL ECONOMY INFLUENCE INDEX

APPENDIX A

The Influence Index

The concept of the influence index arose during the preparation of the EPA 404 report*. In that report, evaluations were made of the individual shortfall influencing variables, e.g., the in-use temperature is not generally the same as EPA test temperature. Any two in-use vehicles are likely to experience conditions that differ both from the EPA conditions and also from each other's. What was needed was a simple numerical metric that measures for each vehicle the overall departure from a set of baseline conditions. This metric is the influence index.

For each in-use parameter that is important for determining EPA-to-Road MPG influences, there is a sensitivity coefficient.

$$SFi = \frac{(MPGi - MPGo) / (MPGi + MPGo)}{(Fi - Fo) / (Fi + Fo)}$$

where MPGi - MPGo is the departure in MPG for the baseline case MPGo caused by factor i, Fi is the value of the factor causing the departure, Fo is the value of the factor at the baseline condition, and SFi is the percent change in MPG due to a percent change in factor i.

According to these definitions,

$$MPGi = MPGo\ [1 + SFi(Fi - Fo)/(Fi + Fo)]/[1 - SFi(Fi - Fo)/(Fi + Fo)]$$

This is the usual definition of sensitivity. For calculations of the influence index, the fuel consumption ratio was considered to be an appropriate index. That is,

$$(1/MPGi)/(1/MPGo) = MPGo/MPGi$$

This ratio is called GPMRi. Thus,

$$GPMRi = [1 - SFi(Fi - Fo)/(Fi + Fo)]/[1 + SFi(Fi - Fo)/(Fi + Fo)]$$

---

*Passenger Car Fuel Economy: EPA and Road, EPA 460/3-80-010, September, 1980.

One of the original influence index concepts was for a GPMR which involved more than one influence factor. If the GPMR for a large number of changes were known it might be possible to learn how to combine individual GPMRi effects. Also, using an in-use data base, the influence index could be used to derive sensitivity coefficients. These then could be compared to existing values of sensitivity coefficient derived from controlled engineering tests. This work is planned for the future.

When this report was prepared, only the engineering test results were known. Another use of the influence index concept however, is possible.

We have not herein involved the influence index in any adjustment methodologies, such as normalizing data to a common influence index. Specifically, we recommend against any such practice with the influence index, in its present form, at this time. But the question of differential influences between different data subsets will remain an item of concern until some degree of improved influence indexing becomes practicable.

In this report, the influence index was used as a tool to screen data. Calculations were made of the MPG ratio effects of individual factors. These were then converted, based on engineering test results, to a series of GPMRi equations. Next, a linear combination of the effects of the influencing factors was assumed, and the largest (4.0) and smallest (0.6) reasonable influence indexes computed. The data-base was then screened by deleting data that had an overall Road GPMR (EPA composite MPG/Road MPG) outside these bounds.

The individual GPMR equations used in this report are shown below in Table A-1. Figures A-1 and A-2 outline the process described above and give a numerical example.

Table A-1

Adjustments Used for Influence Index Calculation

Parameter	GPMR Equation	Reference Docket A-80-32
Temperature	$1/[1 - 0.004(55 - T)]$	2, p. 104
Average Miles Per Day	$1/[0.48 + 0.14 \ln(AMPD)]$	2, p. 151
Population Density	$1/[1.099 - 0.118 \ln(Pop. Dens.)]$	2, p. 243
Wind (City)	$1/[1 + ((0.0084/Ec^{2/3} - 0.00227))W]$	2, p. 116
Wind (Hwy)	$1/[1 + ((0.0498/Eh^{2/3} - 0.0107))W]$	2, p. 116
Odometer	$1/[0.551 + (0.0507 \ln(Odo)]$	6
Topography	Look-up table	2, p. 119
Road Condition	State-by-state look-up table	2, p. 122, plus DOT FHWA Data
Highway Speed	State-by-state look-up table	2, p. 127 plus DOT FHWA data

Notes:

1) The adjustments in Table A-1 were referenced to the average in use conditions for all influences except for wind and road condition. These were referenced to the EPA test conditions.

2) The algorithm for an overall GPMR comprised of n individual influences is given by 1.0 + (the sum of the signed differences between each individual factor and 1.0).

3) The combined GPMRs were applied to the EPAc and EPAh fuel economy values. The resulting city and highway road fuel economy values were combined with the city driving fraction to calculate a composite city-highway weighted adjusted road fuel economy. This was divided into the EPA (55/45) composite fuel economy. The result is the influence index used in this report. In essence, differences from 1.0 in the influence index measure how severely the vehicle is being stressed compared to the base condition. Values greater than 1.0 imply worse fuel economy conditions, while values less than one imply better fuel economy conditions.

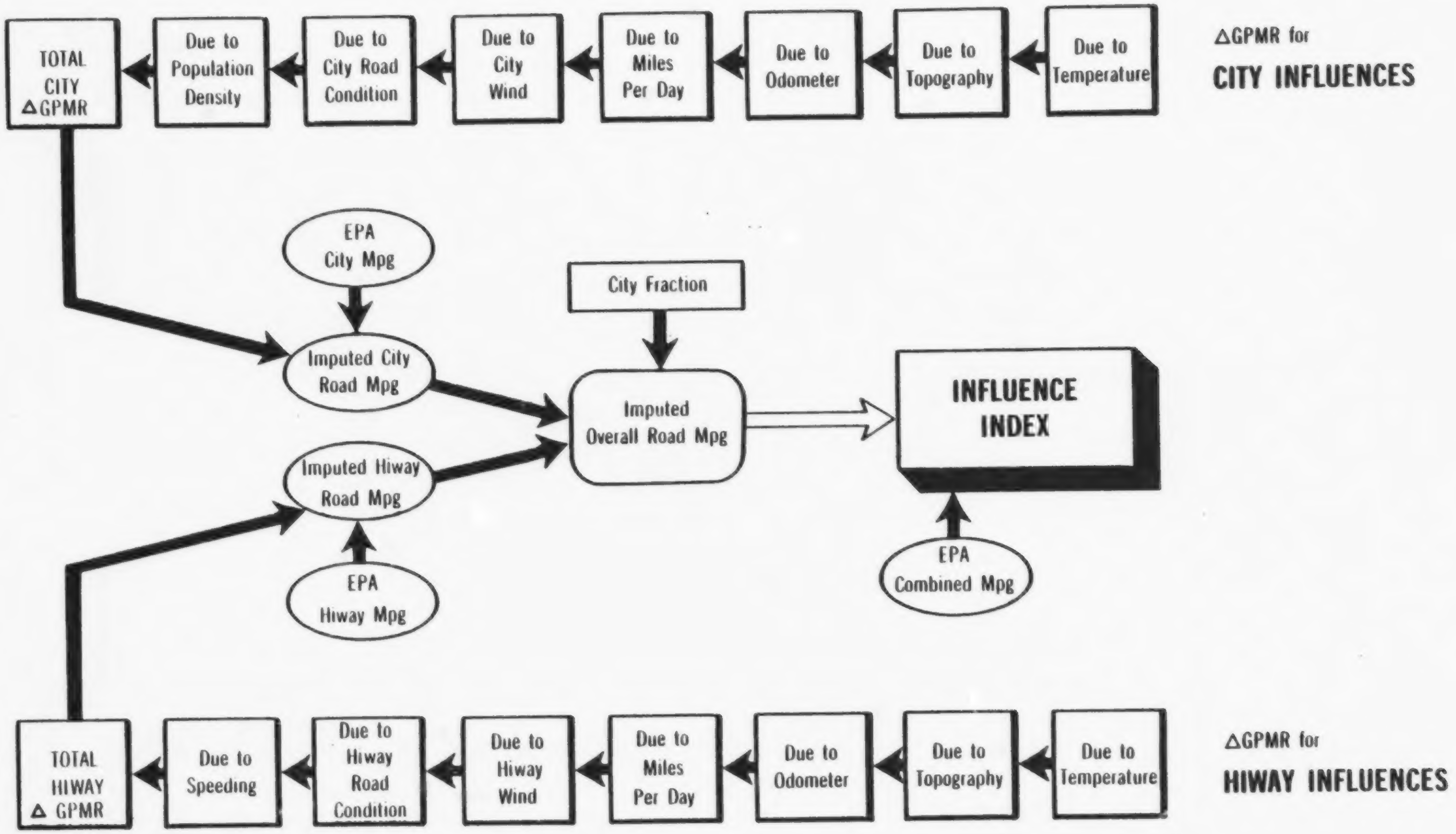
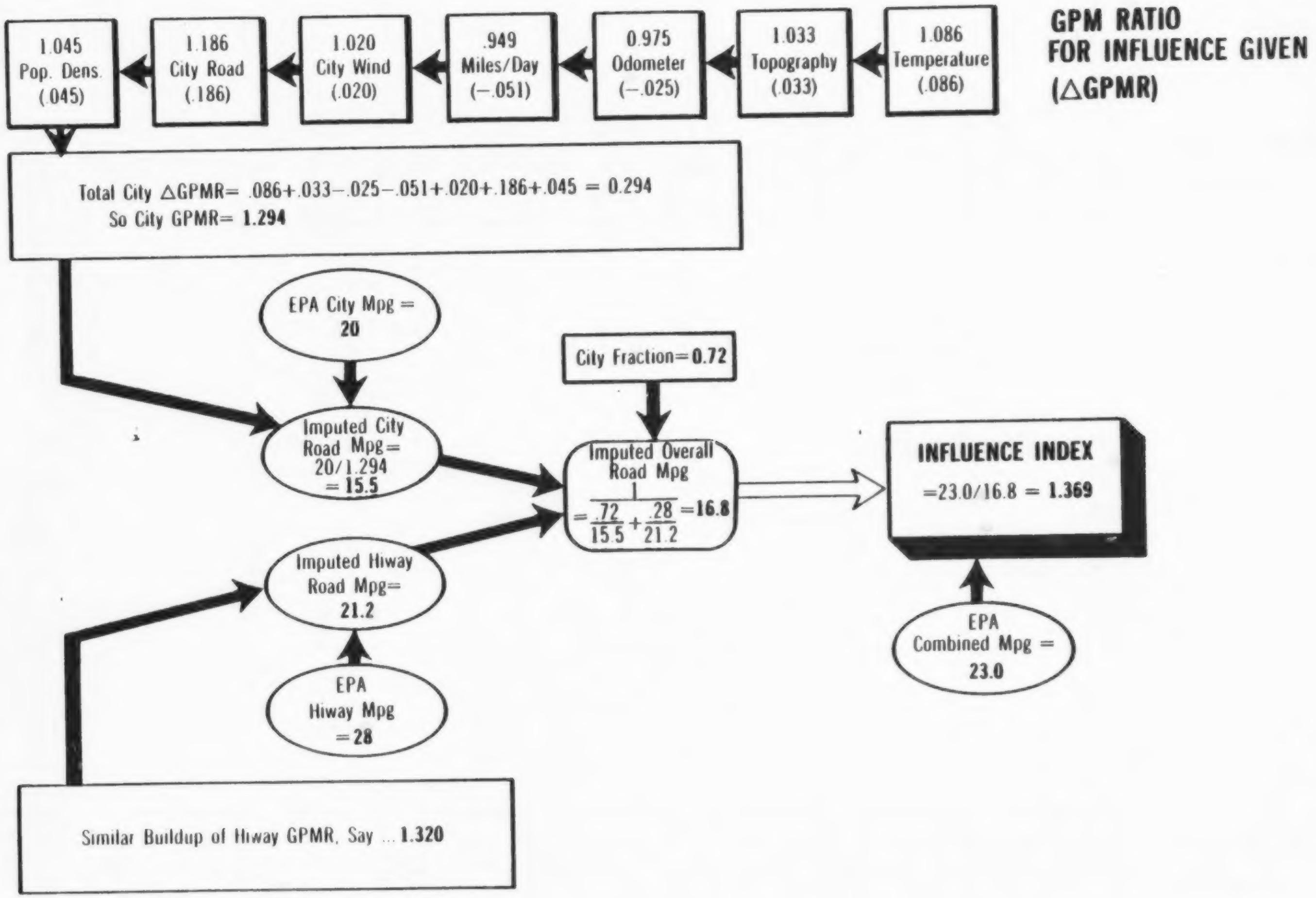

ΔGPMR for
CITY INFLUENCES
Due to Temperature
Due to Topography
Due to Odometer
Due to Miles Per Day
Due to City Wind
Due to City Road Condition
Due to Population Density
TOTAL CITY ΔGPMR
EPA City Mpg
Imputed City Road Mpg
City Fraction
Imputed Overall Road Mpg
INFLUENCE INDEX
EPA Combined Mpg
Imputed Hiway Road Mpg
EPA Hiway Mpg
ΔGPMR for
HIWAY INFLUENCES
Due to Temperature
Due to Topography
Due to Odometer
Due to Miles Per Day
Due to Hiway Wind
Due to Hiway Road Condition
Due to Speeding
TOTAL HIWAY Δ GPMR

Figure
A—1

Development of Influence Index


GPM RATIO
FOR INFLUENCE GIVEN
(△GPMR)
1.086 Temperature (.086)
1.033 Topography (.033)
0.975 Odometer (−.025)
.949 Miles/Day (−.051)
1.020 City Wind (.020)
1.186 City Road (.186)
1.045 Pop. Dens. (.045)
Total City △GPMR= .086+.033−.025−.051+.020+.186+.045 = 0.294
So City GPMR= 1.294
EPA City Mpg = 20
Imputed City Road Mpg= 20/1.294 = 15.5
City Fraction=0.72
Imputed Overall Road Mpg
$= \frac{1}{\frac{.72}{15.5} + \frac{.28}{21.2}} = 16.8$
INFLUENCE INDEX
=23.0/16.8 = 1.369
EPA Combined Mpg = 23.0
Imputed Hiway Road Mpg= 21.2
EPA Hiway Mpg = 28
Similar Buildup of Hiway GPMR, Say ... 1.320

Example of Influence Index Calculation

APPENDIX B

ANALYSES OF SEPARATE DATA SOURCES

TABLE B-1.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : CHRYSLER (MEASURED MPG), 1981

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	430	19	19.9	23	9	16.6	28	1.205	100%	1.162	36%
R:A:I	3	19	19.3	19	17	18.4	21	1.053	82%	1.178	27%
R:M:C	1	24	23.5	24	25	25.0	25	.941	---	1.138	---
F:A:C	579	26	27.3	29	13	23.5	36	1.166	47%	1.181	100%
F:M:C	269	29	31.6	37	20	27.9	38	1.130	100%	1.102	100%

TABLE B-1.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : CHRYSLER (MEASURED MPG), 1981

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.808 - .0303(E)	.067	.192	1.25	19	1.11	23	.719 - 2.267
R:A:I	DATASET NOT REGRESSIBLE				19		19	.944 - 1.145
R:M:C	DATASET NOT REGRESSIBLE				24		24	.941 - .941
F:A:C	GPMR = -.241 + .0515(E)	.375	.151	1.10	26	1.24	29	.776 - 2.150
F:M:C	GPMR = .990 + .0044(E)	.051	.132	1.12	29	1.15	37	.820 - 1.636

TABLE B-1.3

DATA BASE CHARACTERIZATION: FUEL ECONOMY INFLUENCES
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : CHRYSLER (MEASURED MPG), 1981

FUEL ECON INFLUENCE	VEHICLE TECHNOLOGY: R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	6321	11033	.	4200	.	.	5499	.	.	9889	.	.
MILEPDAY	44	44	.	44	.	.	44	.	.	44	.	.
PCT.CITY	64	70	.	50	.	.	63	.	.	52	.	.
POPUDENS	6810	8706	.	6768	.	.	6900	.	.	7137	.	.
TEMPTURE	49	48	.	48	.	.	49	.	.	49	.	.
WIND.MPH	11	11	.	11	.	.	11	.	.	11	.	.

INFLUENCE INDEXES	R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	1.01	.98	.	1.03	.	.	1.03	.	.	.99	.	.
MILEPDAY	.99	.99	.	.99	.	.	.99	.	.	.99	.	.
PCT.CITY	1.03	1.05	.	.98	.	.	1.03	.	.	.99	.	.
POPUDENS	1.00	1.01	.	1.00	.	.	1.00	.	.	1.00	.	.
TEMPTURE	1.02	1.03	.	1.03	.	.	1.03	.	.	1.03	.	.
CITYWIND	1.01	1.01	.	1.01	.	.	1.01	.	.	1.01	.	.
HWAYWIND	1.06	1.06	.	1.06	.	.	1.06	.	.	1.06	.	.
TPOGRAFY	1.00	1.00	.	1.00	.	.	1.00	.	.	1.00	.	.
HWYSPEED	1.01	1.01	.	1.01	.	.	1.02	.	.	1.01	.	.
CITYROAD	1.06	1.07	.	1.07	.	.	1.06	.	.	1.06	.	.
HWAYROAD	1.07	1.08	.	1.08	.	.	1.07	.	.	1.07	.	.
---------	-----	-----	.	-----	.	.	-----	.	.	-----	.	.
TOTINFLU	1.16	1.18 (3 CARS)	. .	1.14 (1 CAR)	. .	. .	1.18	.	.	1.10	. .	. .

TABLE B-2.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), ALL YEARS

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	7977	12	19.0	30	5	15.6	42	1.225	93%
R:A:D	24	24	25.5	27	17	22.4	30	1.142	97%
R:M:C	10	17	18.2	26	12	14.8	21	1.242	34%
F:M:D	5	44	44.5	45	31	40.3	50	1.106	72%

TABLE B-2.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .775 + .0232(E)	.259	.234	1.05	12	1.46	30	.604 - 3.514
R:A:D	GPMR = .593 + .0214(E)	.177	.162	1.11	24	1.17	27	.871 - 1.606
R:M:C	GPMR = .923 + .0170(E)	.442	.144	1.20	17	1.37	26	.957 - 1.477
F:M:D	GPMR = 2.481 - .0309(E)	.059	.239	1.13	44	1.09	45	.896 - 1.429

TABLE B-2.3

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1976

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF#
R:A:C	41	26	28.4	29	8	13.8	27	2.071	86%
R:M:C	7	17	16.6	17	12	13.4	15	1.233	100%

TABLE B-2.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1976

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR =-2.872 + .1736(E)	.276	.501	1.57	26	2.11	29	.952 - 3.505
R:M:C	DATASET NOT REGRESSIBLE				17		17	1.120 - 1.404

TABLE B-2.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1977

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	2880	12	18.2	30	6	14.9	31	1.228	28%
F:M:D	1	44	43.9	44	39	38.7	39	1.136	---

TABLE B-2.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1977

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .496 + .0397(E)	.421	.213	.97	12	1.67	30	.669 - 2.878
F:M:D	DATASET NOT REGRESSIBLE				44		44	1.136 - 1.136

TABLE B-2.7

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1978

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF*
R:A:C	3080	14	20.1	28	5	16.0	42	1.262	35%
R:A:D	9	24	24.3	24	19	20.8	25	1.165	99%
R:M:C	3	20	23.6	26	18	19.2	21	1.263	1%
F:M:D	1	45	45.0	45	41	40.5	41	1.110	---

TABLE B-2.8

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1978

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.172 + .0044(E)	.048	.243	1.23	14	1.30	28	.604 - 3.508
R:A:D	DATASET NOT REGRESSIBLE				24		24	.971 - 1.258
R:M:C	GPMR = -.486 + .0729(E)	.975	.086	.96	20	1.42	26	.957 - 1.477
F:M:D	DATASET NOT REGRESSIBLE				45		45	1.110 - 1.110

TABLE B-2.9

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1979

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	1846	15	18.5	27	5	16.1	27	1.152	28%
R:A:D	15	24	26.4	27	17	23.5	30	1.128	34%

TABLE B-2.10

IN USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1979

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .989 + .0088(E)	.087	.189	1.12	15	1.22	27	.661 - 3.514
R:A:D	GPMR =-1.087 + .0839(E)	.460	.177	.93	24	1.18	27	.871 - 1.606

TABLE B-2.11

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1980

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	130	20	21.3	27	14	20.5	31	1.040	3%
F:M:D	3	45	44.6	45	31	40.8	50	1.094	22%

TABLE B-2.12

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (FLEET MPG), 1980

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.024 + .0007(E)	.011	.122	1.04	20	1.04	27	.777 - 1.420
F:M:D	DATASET NOT REGRESSIBLE				45		45	.896 - 1.429

TABLE B-3.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	317	13	19.5	30	11	16.4	26	1.193	94%
R:A:I	2	17	18.6	20	14	15.7	18	1.183	4%
R:A:D	24	22	24.7	27	16	22.5	30	1.098	96%
R:M:C	19	20	28.4	39	15	21.7	31	1.305	100%
R:M:D	4	27	27.7	29	24	26.2	29	1.056	93%
F:A:C	19	15	23.4	28	13	20.8	26	1.125	100%
F:A:D	1	24	24.0	24	22	22.0	22	1.090	---
F:M:C	3	29	32.2	39	21	25.3	29	1.274	74%
F:M:D	16	40	44.0	45	31	43.3	53	1.015	100%

TABLE B-3.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .994 + .0100(E)	.251	.116	1.12	13	1.29	30	.920 - 1.671
R:A:I	DATASET NOT REGRESSIBLE				17		20	1.120 - 1.247
R:A:D	GPMR = .148 + .0384(E)	.271	.176	.99	22	1.18	27	.808 - 1.550
R:M:C	GPMR = 1.581 - .0094(E)	.296	.158	1.39	20	1.22	39	1.103 - 1.694
R:M:D	GPMR = .842 + .0077(E)	.108	.106	1.05	27	1.07	29	.980 - 1.138
F:A:C	GPMR = 1.092 + .0014(E)	.063	.068	1.11	15	1.13	28	1.032 - 1.325
F:A:D	DATASET NOT REGRESSIBLE				24		24	1.090 - 1.090
F:M:C	GPMR = 1.180 + .0029(E)	.142	.145	1.26	29	1.29	39	1.156 - 1.351
F:M:D	GPMR = 3.883 - .0651(E)	.461	.155	1.29	40	.95	45	.845 - 1.408

TABLE B-3.3

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1977

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	109	15	19.0	30	11	15.7	26	1.215	32%
R:A:I	1	20	20.3	20	18	18.1	18	1.120	---
R:A:D	1	25	25.0	25	23	23.4	23	1.070	---
R:M:C	6	27	28.8	30	18	21.9	26	1.313	93%
R:M:D	1	28	28.4	28	29	29.0	29	.980	---
F:A:C	1	15	15.1	15	13	13.2	13	1.148	---
F:M:D	2	44	43.9	44	35	36.6	38	1.201	23%

TABLE B-3.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1977

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .954 + .0135(E)	.389	.106	1.15	15	1.35	30	.929 - 1.564
R:A:I	DATASET NOT REGRESSIBLE				20		20	1.120 - 1.120
R:A:D	DATASET NOT REGRESSIBLE				25		25	1.070 - 1.070
R:M:C	GPMR = 2.292 - .0339(E)	.606	.087	1.39	27	1.27	30	1.177 - 1.455
R:M:D	DATASET NOT REGRESSIBLE				28		28	.980 - .980
F:A:C	DATASET NOT REGRESSIBLE				15		15	1.148 - 1.148
F:M:D	DATASET NOT REGRESSIBLE				44		44	1.153 - 1.250

TABLE B-3.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1978

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	151	13	19.4	28	12	16.6	26	1.171	10%
R:A:D	7	22	23.9	24	16	20.7	26	1.160	10%
R:M:C	10	20	28.7	39	16	23.2	31	1.237	82%
R:M:D	1	29	29.1	29	26	25.8	26	1.125	---
F:M:C	2	31	34.3	39	27	27.9	29	1.235	44%
F:M:D	4	45	45.0	45	43	46.8	53	.961	97%

TABLE B-3.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1978

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.055 + .0058(E)	.148	.104	1.13	13	1.22	28	.920 - 1.415
R:A:D	GPMR = .068 + .0456(E)	.207	.214	1.07	22	1.18	24	.919 - 1.550
R:M:C	GPMR = 1.311 - .0025(E)	.117	.151	1.26	20	1.22	39	1.103 - 1.522
R:M:D	DATASET NOT REGRESSIBLE				29		29	1.125 - 1.125
F:M:C	DATASET NOT REGRESSIBLE				31		39	1.156 - 1.315
F:M:D	DATASET NOT REGRESSIBLE				45		45	.845 - 1.056

TABLE B-3.7

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1979

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	25	14	19.6	27	11	16.6	21	1.188	79%
R:A:D	11	24	24.8	27	17	22.8	30	1.091	56%
R:M:C	1	25	24.6	25	15	14.5	15	1.694	---
F:A:C	3	18	23.3	27	17	22.0	26	1.052	95%
F:A:D	1	24	24.0	24	22	22.0	22	1.090	---
F:M:D	8	40	43.4	44	31	42.7	50	1.012	87%

TABLE B-3.8

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1979

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.017 + .0086(E)	.124	.189	1.14	14	1.25	27	.974 - 1.662
R:A:D	GPMR = -.987 + .0837(E)	.582	.173	1.02	24	1.27	27	.808 - 1.432
R:M:C	DATASET NOT REGRESSIBLE				25		25	1.694 - 1.694
F:A:C	GPMR = 1.216 - .0068(E)	1.000	.000	1.09	18	1.03	27	1.032 - 1.092
F:A:D	DATASET NOT REGRESSIBLE				24		24	1.090 - 1.090
F:M:D	GPMR = 4.201 - .0733(E)	.511	.193	1.28	40	.97	44	.879 - 1.408

TABLE B-3.9

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1980

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	23	19	21.5	27	13	18.1	23	1.192	76%
R:A:D	4	26	26.1	26	22	24.6	27	1.063	88%
R:M:C	2	28	28.0	28	19	19.6	20	1.428	90%
F:A:C	14	24	24.0	26	20	21.4	25	1.125	99%
F:M:C	1	29	28.8	29	21	21.3	21	1.351	---
F:M:D	2	45	44.6	45	46	47.1	48	.948	95%

TABLE B-3.10

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (MEASURED MPG), 1980

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.099 + .0043(E)	.090	.129	1.18	19	1.21	27	1.065 - 1.671
R:A:D	DATASET NOT REGRESSIBLE				26		26	.969 - 1.189
R:M:C	DATASET NOT REGRESSIBLE				28		28	1.385 - 1.472
F:A:C	GPMR = 1.101 + .0010(E)	.028	.041	1.12	24	1.13	26	1.050 - 1.212
F:M:C	DATASET NOT REGRESSIBLE				29		29	1.351 - 1.351
F:M:D	DATASET NOT REGRESSIBLE				45		45	.930 - .966

TABLE B-4.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), ALL YEARS

		+++ EPA MPG +++			+++ ROAD MPG +++						
VEHICLE TECHNOL	NUMBER OF VEH	MIN	HMAV	MAX	MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
R:A:I	49	14	16.5	21	10	14.9	25	1.101	30%	1.227	8%
R:A:D	108	22	24.6	28	12	20.9	37	1.180	100%	1.210	72%
R:M:I	47	14	20.6	23	16	20.7	32	.998	100%	1.208	55%
F:A:C	169	11	23.5	32	9	21.8	40	1.084	25%	1.283	99%
F:A:I	39	17	20.2	27	10	19.3	32	1.038	89%	1.275	57%
F:A:D	4	24	23.9	24	14	17.6	20	1.357	89%	1.234	4%
F:M:C	201	23	32.3	40	19	28.9	45	1.128	99%	1.202	90%
F:M:I	122	18	28.8	30	17	28.2	48	1.024	100%	1.225	17%
F:M:D	68	40	44.2	45	24	40.3	55	1.096	17%	1.202	71%

TABLE B-4.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:I	GPMR = 1.456 - .0213(E)	.217	.188	1.16	14	1.00	21	.625 - 1.488
R:A:D	GPMR = .055 + .0456(E)	.279	.231	1.06	22	1.31	28	.674 - 2.238
R:M:I	GPMR = 1.029 - .0015(E)	.016	.144	1.01	14	.99	23	.671 - 1.245
F:A:C	GPMR = .967 + .0047(E)	.092	.232	1.02	11	1.12	32	.668 - 2.970
F:A:I	GPMR = 1.325 - .0138(E)	.246	.195	1.09	17	.96	27	.672 - 1.676
F:A:D	DATASET NOT REGRESSIBLE				24		24	1.196 - 1.709
F:M:C	GPMR = .417 + .0217(E)	.435	.173	.93	23	1.28	40	.785 - 1.863
F:M:I	GPMR = .947 + .0027(E)	.019	.204	.99	18	1.03	30	.608 - 1.646
F:M:D	GPMR = 4.321 - .0729(E)	.332	.204	1.42	40	1.06	45	.820 - 1.838

TABLE B-4.3

DATA BASE CHARACTERIZATION: FUEL ECONOMY INFLUENCES
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), ALL YEARS

FUEL ECON INFLUENCE	VEHICLE TECHNOLOGY: R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	.	7515	6648	.	8543	.	6596	7353	7000	8169	7725	7912
MILEPDAY	.	36	38	.	36	.	35	33	46	40	38	40
PCT.CITY	.	52	41	.	52	.	48	47	48	44	47	38
POPUDENS	.	4790	4794	.	3496	.	4511	4076	4240	5110	4479	6017
TEMPTURE	.	43	36	.	42	.	34	39	24	36	36	36
WIND.MPH	.	11	12	.	12	.	12	12	14	12	12	12

INFLUENCE INDEXES	R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	.	1.01	1.02	.	1.00	.	1.02	1.02	1.01	1.00	1.01	1.01
MILEPDAY	.	1.04	1.04	.	1.04	.	1.07	1.11	.99	1.03	1.05	1.03
PCT.CITY	.	.99	.96	.	.99	.	.98	.97	.98	.96	.97	.95
POPUDENS	.	1.00	.99	.	.99	.	.99	.99	1.00	1.00	1.00	1.00
TEMPTURE	.	1.05	1.08	.	1.06	.	1.10	1.07	1.14	1.08	1.09	1.09
CITYWIND	.	1.01	1.01	.	1.01	.	1.01	1.01	1.02	1.01	1.01	1.01
HWAYWIND	.	1.07	1.07	.	1.07	.	1.07	1.07	1.08	1.07	1.07	1.07
TPOGRAFY	.	1.03	1.01	.	1.03	.	1.01	1.01	1.00	1.02	1.02	1.01
HWYSPEED	.	1.02	1.02	.	1.02	.	1.02	1.02	1.02	1.02	1.02	1.02
CITYROAD	.	1.05	1.05	.	1.05	.	1.05	1.05	1.06	1.05	1.05	1.05
HWAYROAD	.	1.06	1.06	.	1.06	.	1.06	1.06	1.07	1.06	1.06	1.06
---------	.	-----	-----	.	-----	.	-----	-----	-----	-----	-----	-----
TOTINFLU	.	1.23	1.21	.	1.21	.	1.28	1.28	1.23	1.20	1.22	1.20

TABLE B-4.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), 1978

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:I	32	14	17.0	21	10	15.7	25	1.079	45%	1.206	14%
R:A:D	30	22	24.4	28	15	23.6	37	1.031	59%	1.182	41%
R:M:I	40	14	20.6	23	16	20.6	32	.997	99%	1.205	12%
F:A:C	89	11	22.9	32	11	22.3	34	1.047	48%	1.219	57%
F:A:I	24	18	22.1	27	17	22.6	32	.984	98%	1.206	12%
F:M:C	120	23	34.2	40	20	29.6	45	1.167	100%	1.181	64%
F:M:I	71	18	28.4	29	17	29.2	48	.974	100%	1.204	11%
F:M:D	41	40	44.4	45	26	43.2	55	1.025	91%	1.178	43%

TABLE B-4.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), 1978

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	● EPA=	GPMR=	● EPA=	
R:A:I	GPMR = 1.486 - .0235(E)	.275	.173	1.16	14	.98	21	.770 - 1.488
R:A:D	GPMR = 1.466 - .0177(E)	.142	.187	1.08	22	.98	28	.674 - 1.630
R:M:I	GPMR = 1.048 - .0025(E)	.029	.139	1.01	14	.99	23	.671 - 1.214
F:A:C	GPMR = .774 + .0111(E)	.318	.173	.90	11	1.13	32	.685 - 1.639
F:A:I	GPMR = .770 + .0095(E)	.190	.152	.94	18	1.02	27	.672 - 1.303
F:M:C	GPMR = .370 + .0230(E)	.447	.178	.91	23	1.28	40	.786 - 1.863
F:M:I	GPMR = 1.155 - .0063(E)	.054	.209	1.04	18	.97	29	.608 - 1.646
F:M:D	GPMR = 5.274 - .0956(E)	.794	.079	1.47	40	1.00	45	.820 - 1.552

TABLE B-4.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), 1979

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
R:A:I	17	14	15.5	19	10	13.6	25	1.142	3%	1.265	7%
R:A:D	78	23	24.7	27	12	20.1	34	1.237	100%	1.220	97%
R:M:I	7	21	21.1	21	17	21.0	26	1.004	90%	1.226	45%
F:A:C	80	18	24.1	27	9	21.3	40	1.125	37%	1.354	100%
F:A:I	15	17	17.8	23	10	15.7	25	1.124	20%	1.386	61%
F:A:D	4	24	23.9	24	14	17.6	20	1.357	83%	1.234	30%
F:M:C	81	29	29.8	30	19	27.9	38	1.069	100%	1.234	81%
F:M:I	51	28	29.4	30	18	26.9	40	1.094	93%	1.253	32%
F:M:D	27	40	43.9	44	24	36.6	51	1.203	76%	1.237	67%

TABLE B-4.7

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : DOE (PERCEIVED MPG), 1979

VEHICLE TECHNOL	REGPESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:I	GPMR = .547 + .0383(E)	.164	.218	1.09	14	1.26	19	.625 - 1.434
R:A:D	GPMR = -.310 + .0624(E)	.388	.217	1.13	23	1.37	27	.704 - 2.238
R:M:I	GPMR =-2.895 + .1848(E)	.267	.193	.89	21	1.02	21	.814 - 1.245
F:A:C	GPMR = 1.387 - .0106(E)	.140	.272	1.20	18	1.10	27	.668 - 2.970
F:A:I	GPMR = 1.755 - .0349(E)	.349	.231	1.17	17	.94	23	.838 - 1.676
F:A:D	DATASET NOT REGRESSIBLE				24		24	1.196 - 1.709
F:M:C	GPMR = 5.767 - .1577(E)	.112	.165	1.16	29	1.03	30	.785 - 1.570
F:M:I	GPMR = 3.167 - .0705(E)	.207	.174	1.19	28	1.08	30	.740 - 1.646
F:M:D	GPMR =-2.175 + .0768(E)	.212	.271	.91	40	1.21	44	.865 - 1.838

TABLE B-5.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	582	12	19.5	32	7	15.6	31	1.251	100%	1.105	53%
R:A:I	10	18	21.2	28	13	18.2	23	1.159	74%	1.107	8%
R:M:C	145	18	28.4	41	14	23.9	38	1.187	89%	1.095	29%
R:M:I	14	19	22.7	32	17	21.0	31	1.092	98%	.991	100%
F:A:C	98	13	25.2	32	11	21.3	31	1.184	83%	1.139	94%
F:A:I	23	16	19.0	27	11	15.8	26	1.192	44%	1.154	78%
F:M:C	112	24	32.1	42	18	28.9	50	1.121	100%	1.093	35%
F:M:I	27	27	29.5	33	19	28.9	38	1.022	100%	1.018	99%

TABLE B-5.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.207 + .0022(E)	.042	.182	1.23	12	1.28	32	.805 - 1.872
R:A:I	GPMR = 1.274 - .0054(E)	.117	.142	1.18	18	1.12	28	1.000 - 1.463
R:M:C	GPMR = 1.157 + .0010(E)	.030	.173	1.18	18	1.20	41	.693 - 1.680
R:M:I	GPMR = .841 + .0108(E)	.276	.161	1.04	19	1.19	32	.868 - 1.311
F:A:C	GPMR = 1.161 + .0009(E)	.013	.186	1.17	13	1.19	32	.870 - 2.050
F:A:I	GPMR = 1.444 - .0128(E)	.373	.139	1.24	16	1.09	27	1.009 - 1.436
F:M:C	GPMR = .728 + .0120(E)	.341	.150	1.02	24	1.23	42	.645 - 1.604
F:M:I	GPMR = 1.127 - .0036(E)	.046	.146	1.03	27	1.01	33	.809 - 1.474

TABLE B-5.3

DATA BASE CHARACTERIZATION: FUEL ECONOMY INFLUENCES
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), ALL YEARS

FUEL ECON INFLUENCE	VEHICLE TECHNOLOGY: R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	19790	10140	.	20177	22594	.	10921	13686	.	14875	14269	.
MILEPDAY	36	48	.	37	46	.	34	32	.	39	44	.
PCT.CITY	66	58	.	64	55	.	62	68	.	58	48	.
POPUDENS	4113	4528	.	4037	3749	.	4248	4804	.	4167	4731	.
TEMPTURE	67	68	.	65	71	.	65	66	.	63	67	.
WIND.MPH	9	9	.	10	9	.	10	9	.	10	9	.

INFLUENCE INDEXES	R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	.97	.99	.	.97	.96	.	.99	.99	.	.98	.98	.
MILEPDAY	1.06	1.05	.	1.04	1.00	.	1.06	1.07	.	1.03	1.02	.
PCT.CITY	1.04	1.01	.	1.03	1.00	.	1.02	1.04	.	1.01	.98	.
POPUDENS	1.00	1.00	.	1.00	1.00	.	1.00	1.00	.	1.00	1.00	.
TEMPTURE	.96	.95	.	.96	.95	.	.96	.96	.	.97	.96	.
CITYWIND	1.01	1.01	.	1.01	1.01	.	1.01	1.01	.	1.01	1.01	.
HWAYWIND	1.05	1.05	.	1.06	1.05	.	1.06	1.05	.	1.06	1.05	.
TPOGRAFY	1.00	1.00	.	1.00	1.00	.	1.00	1.00	.	1.00	1.00	.
HWYSPEED	1.04	1.04	.	1.03	1.04	.	1.04	1.04	.	1.03	1.03	.
CITYROAD	1.04	1.04	.	1.05	1.05	.	1.04	1.04	.	1.05	1.04	.
HWAYROAD	1.07	1.06	.	1.07	1.07	.	1.07	1.06	.	1.07	1.07	.
---------	-----	-----	.	-----	-----	.	-----	-----	.	-----	-----	.
TOTINFLU	1.11	1.11	.	1.09	.99	.	1.14	1.15	.	1.09	1.02	.

TABLE B-5.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1977

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
R:A:C	43	13	17.2	22	9	13.4	22	1.291	21%	1.072	6%
R:A:I	1	19	18.9	19	15	15.4	15	1.227	---	1.494	---
R:M:C	6	20	28.2	35	16	19.5	25	1.454	96%	1.088	25%
R:M:I	2	21	20.9	21	17	18.1	20	1.157	56%	1.037	44%
F:A:I	1	27	27.4	27	26	26.1	26	1.050	---	.866	---
F:M:C	3	33	38.5	42	26	28.4	32	1.384	33%	.957	75%
F:M:I	1	29	28.5	29	30	29.9	30	.954	---	1.012	---

TABLE B-5.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1977

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .909 + .0218(E)	.190	.233	1.19	13	1.38	22	.946 - 1.972
R:A:I	DATASET NOT REGRESSIBLE				19		19	1.227 - 1.227
R:M:C	GPMR = 1.259 + .0067(E)	.275	.144	1.39	20	1.50	35	1.295 - 1.627
R:M:I	DATASET NOT REGRESSIBLE				21		21	1.040 - 1.274
F:A:I	DATASET NOT REGRESSIBLE				27		27	1.050 - 1.050
F:M:C	GPMR = -.857 + .0575(E)	.990	.058	1.05	33	1.55	42	1.051 - 1.592
F:M:I	DATASET NOT REGRESSIBLE				29		29	.954 - .954

TABLE B-5.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1978

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	92	13	19.4	28	9	15.4	25	1.259	75%	1.104	59%
R:M:C	24	20	28.8	39	14	23.8	36	1.215	42%	1.074	37%
R:M:I	1	19	18.5	19	19	18.8	19	.984	---	.872	---
F:A:C	2	30	30.0	30	23	23.6	24	1.274	63%	.983	64%
F:A:I	3	23	25.0	26	22	23.4	24	1.070	99%	1.049	45%
F:M:C	11	30	34.4	39	24	29.3	35	1.183	71%	1.049	86%
F:M:I	1	30	29.5	30	28	28.3	28	1.046	---	.963	---

TABLE B-5.7

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1978

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.220 + .0020(E)	.041	.159	1.25	13	1.28	28	.862 - 1.677
R:M:C	GPMR = 1.024 + .0064(E)	.178	.215	1.15	20	1.27	39	.883 - 1.680
R:M:I	DATASET NOT REGRESSIBLE				19		19	.984 - .984
F:A:C	DATASET NOT REGRESSIBLE				30		30	1.252 - 1.297
F:A:I	GPMR = .648 + .0168(E)	.901	.018	1.04	23	1.09	26	1.037 - 1.093
F:M:C	GPMR = .590 + .0170(E)	.438	.160	1.09	30	1.26	39	.847 - 1.434
F:M:I	DATASET NOT REGRESSIBLE				30		30	1.046 - 1.046

TABLE B-5.8

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1979

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
R:A:C	100	13	19.1	28	7	15.2	27	1.252	100%	1.108	93%
R:A:I	1	19	18.9	19	16	15.6	16	1.217	---	.801	---
R:M:C	28	20	25.4	40	16	22.4	33	1.136	99%	1.053	62%
R:M:I	3	21	21.9	23	17	19.3	25	1.139	25%	1.006	57%
F:A:C	7	18	24.4	27	15	23.3	26	1.046	99%	.979	99%
F:A:I	4	16	17.9	26	11	15.4	24	1.153	29%	1.094	14%
F:M:C	11	27	30.5	37	23	28.9	35	1.060	99%	1.105	49%
F:M:I	7	28	29.2	31	22	29.3	34	.998	99%	1.008	60%

TABLE B-5.9

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1979

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR= @	EPA=	GPMR= @	EPA=	
R:A:C	GPMR = 1.234 + .0009(E)	.012	.199	1.25	13	1.26	28	.883 - 1.921
R:A:I	DATASET NOT REGRESSIBLE				19		19	1.217 - 1.217
R:M:C	GPMR = 1.118 + .0007(E)	.034	.105	1.13	20	1.14	40	.936 - 1.337
R:M:I	GPMR =-2.620 + .1717(E)	.625	.262	1.05	21	1.31	23	.868 - 1.311
F:A:C	GPMR = 1.238 - .0077(E)	.278	.095	1.10	18	1.03	27	.914 - 1.181
F:A:I	GPMR = 1.306 - .0081(E)	.229	.216	1.18	16	1.09	26	1.009 - 1.418
F:M:C	GPMR = .679 + .0124(E)	.241	.128	1.01	27	1.13	37	.841 - 1.281
F:M:I	GPMR = 1.737 - .0253(E)	.213	.161	1.04	28	.94	31	.863 - 1.280

TABLE B-5.10

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1980

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	169	16	20.5	30	11	16.6	30	1.235	100%	1.130	0%
R:A:I	5	20	21.9	23	13	18.6	23	1.170	19%	1.101	30%
R:M:C	41	18	28.4	35	16	24.0	35	1.181	30%	1.140	28%
R:M:I	3	22	23.4	25	19	22.2	26	1.059	64%	.943	93%
F:A:C	37	21	25.0	32	12	21.0	28	1.190	0%	1.139	20%
F:A:I	13	17	18.2	26	12	14.8	22	1.224	58%	1.207	75%
F:M:C	33	24	31.0	41	22	29.3	50	1.057	100%	1.091	83%
F:M:I	14	27	28.9	31	19	27.7	38	1.044	99%	1.045	85%

TABLE B-5.11

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
12 VEHICLE TECHNOLOGY STRATA

DATA SOURCE : EPA (MEASURED MPG), 1980

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR= @	EPA=	GPMR= @	EPA=	
R:A:C	GPMR = 1.151 + .0040(E)	.065	.181	1.21	16	1.27	30	.805 - 1.914
R:A:I	GPMR = 3.920 - .1252(E)	.955	.061	1.47	20	1.04	23	1.000 - 1.463
R:M:C	GPMR = 1.352 - .0059(E)	.161	.156	1.24	18	1.14	35	.856 - 1.527
R:M:I	GPMR = .337 + .0307(E)	.268	.261	1.00	22	1.10	25	.927 - 1.278
F:A:C	GPMR = 1.558 - .0146(E)	.165	.206	1.25	21	1.09	32	.961 - 2.050
F:A:I	GPMR = 1.313 - .0048(E)	.117	.149	1.23	17	1.19	26	1.051 - 1.436
F:M:C	GPMR = .959 + .0031(E)	.099	.138	1.03	24	1.09	41	.645 - 1.408
F:M:I	GPMR = .762 + .0097(E)	.089	.173	1.03	27	1.06	31	.809 - 1.474

TABLE B-5.12

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1981

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
R:A:C	118	18	22.5	32	13	17.8	31	1.260	100%	1.102	40%
R:A:I	3	18	21.7	28	17	20.0	23	1.098	82%	1.090	11%
R:M:C	37	24	31.0	41	16	25.9	38	1.194	41%	1.097	36%
R:M:I	4	21	26.7	32	20	24.0	31	1.122	71%	1.024	98%
F:A:C	50	23	25.8	31	16	21.6	31	1.194	48%	1.173	96%
F:A:I	2	18	17.5	18	13	13.3	14	1.319	67%	1.224	80%
F:M:C	51	25	32.6	42	18	28.7	42	1.141	100%	1.113	10%
F:M:I	4	33	32.9	33	31	33.0	37	.997	99%	.955	92%

TABLE B-5.13

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (MEASURED MPG), 1981

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	ACTUAL GPMR RANGE
R:A:C	GPMR = 1.301 - .0018(E)	.034	.165	1.27	18	1.24	32	.909 - 1.709
R:A:I	GPMR = .687 + .0183(E)	.994	.014	1.01	18	1.20	28	1.020 - 1.204
R:M:C	GPMR = 1.436 - .0077(E)	.181	.178	1.26	24	1.13	41	.693 - 1.633
R:M:I	GPMR = .902 + .0080(E)	.317	.159	1.07	21	1.16	32	.981 - 1.248
F:A:C	GPMR = .913 + .0108(E)	.113	.182	1.17	23	1.25	31	.870 - 1.637
F:A:I	DATASET NOT REGRESSIBLE				18		18	1.257 - 1.381
F:M:C	GPMR = .889 + .0076(E)	.237	.145	1.08	25	1.21	42	.888 - 1.604
F:M:I	DATASET NOT REGRESSIBLE				33		33	.895 - 1.076

TABLE B-6.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (PERCEIVED MPG), ALL YEARS

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	322	13	18.8	29	8	16.1	31	1.175	83%
R:A:I	20	16	16.8	17	12	14.8	20	1.134	94%
R:A:D	1	24	24.3	24	28	27.7	28	.877	---
R:M:C	187	20	27.7	42	11	22.5	35	1.248	96%
R:M:I	25	20	21.3	26	16	20.2	27	1.061	100%
F:A:C	11	14	16.4	28	12	15.6	24	1.053	98%
F:A:I	1	28	28.1	28	29	29.3	29	.958	---
F:M:C	59	24	33.2	45	12	27.4	38	1.222	54%
F:M:I	9	28	28.6	30	22	26.7	32	1.071	95%

TABLE B-6.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (PERCEIVED MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR= @	EPA=	GPMR= @	EPA=	
R:A:C	GPMR = 1.017 + .0081(E)	.168	.186	1.12	13	1.25	29	.717 - 1.869
R:A:I	GPMR = .747 + .0231(E)	.113	.127	1.11	16	1.14	17	.881 - 1.355
R:A:D	DATASET NOT REGRESSIBLE				24		24	.877 - .877
R:M:C	GPMR = .127 + .0397(E)	.403	.350	.91	20	1.79	42	.781 - 3.575
R:M:I	GPMR = .835 + .0105(E)	.294	.091	1.04	20	1.11	26	.919 - 1.303
F:A:C	GPMR = .906 + .0087(E)	.205	.173	1.02	14	1.15	28	.881 - 1.467
F:A:I	DATASET NOT REGRESSIBLE				28		28	.958 - .958
F:M:C	GPMR = .569 + .0194(E)	.239	.319	1.04	24	1.43	45	.768 - 2.829
F:M:I	GPMR = 4.489 - .1196(E)	.280	.158	1.12	28	.96	30	.915 - 1.325

TABLE B-6.3

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (PERCEIVED MPG), 1976

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	67	19	23.5	29	14	19.9	29	1.188	27%
R:A:I	14	17	17.2	17	14	15.0	20	1.143	75%
R:M:C	109	20	26.9	33	12	22.1	35	1.224	86%
R:M:I	24	20	21.3	26	16	20.2	27	1.058	100%
F:A:C	5	14	15.5	28	12	15.0	24	1.043	92%
F:A:I	1	28	28.1	28	29	29.3	29	.958	---
F:M:C	40	24	32.1	36	15	27.3	38	1.176	9%

TABLE B-6.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (PERCEIVED MPG), 1976

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = .754 + .0182(E)	.257	.194	1.11	19	1.28	29	.757 - 1.678
R:A:I	DATASET NOT REGRESSIBLE				17		17	.881 - 1.258
R:M:C	GPMR = .627 + .0219(E)	.193	.305	1.06	20	1.36	33	.781 - 2.847
R:M:I	GPMR = .834 + .0104(E)	.294	.092	1.04	20	1.10	26	.919 - 1.303
F:A:C	GPMR = .900 + .0085(E)	.412	.136	1.01	14	1.14	28	.902 - 1.154
F:A:I	DATASET NOT REGRESSIBLE				28		28	.958 - .958
F:M:C	GPMR = .759 + .0129(E)	.138	.257	1.07	24	1.23	36	.768 - 2.280

TABLE B-6.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (PERCEIVED MPG), 1977

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	248	13	17.9	29	8	15.3	31	1.173	98%
R:A:I	6	16	15.9	16	12	14.2	17	1.113	77%
R:M:C	77	20	28.8	42	11	23.0	35	1.278	86%
R:M:I	1	22	21.9	22	20	19.6	20	1.120	---
F:A:C	6	17	17.2	17	12	16.2	20	1.063	84%
F:M:C	19	33	35.9	45	12	27.4	38	1.319	76%
F:M:I	8	28	28.5	29	22	26.1	30	1.091	92%

TABLE B-6.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : EPA (PERCEIVED MPG), 1977

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.011 + .0088(E)	.158	.182	1.12	13	1.26	29	.739 - 1.869
R:A:I	DATASET NOT REGRESSIBLE				16		16	.957 - 1.355
R:M:C	GPMR = -.277 + .0528(E)	.519	.402	.76	20	1.94	42	.871 - 3.575
R:M:I	DATASET NOT REGRESSIBLE				22		22	1.120 - 1.120
F:A:C	DATASET NOT REGRESSIBLE				17		17	.881 - 1.467
F:M:C	GPMR = .741 + .0159(E)	.177	.436	1.26	33	1.45	45	.871 - 2.829
F:M:I	GPMR =-12.77 + .4871(E)	.340	.154	.87	28	1.36	29	.940 - 1.325

TABLE B-7.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	25445	14	18.1	26	5	14.9	37	1.220	100%	1.191	67%
R:A:I	382	19	19.3	19	8	15.7	27	1.227	89%	1.188	16%
R:M:C	3550	18	24.0	29	8	20.1	34	1.197	100%	1.183	91%
F:M:C	890	29	32.5	38	11	29.7	56	1.103	100%	1.157	100%

TABLE B-7.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	ACTUAL GPMR RANGE
R:A:C	GPMR = 1.069 + .0081(E)	.107	.217	1.18	14	1.28	26	.602 - 3.781
R:A:I	GPMR = .266 + .0499(E)	.032	.210	1.20	19	1.23	19	.699 - 2.331
R:M:C	GPMR = .621 + .0237(E)	.302	.210	1.06	18	1.31	29	.693 - 3.550
F:M:C	GPMR = .389 + .0217(E)	.377	.190	1.02	29	1.22	38	.679 - 3.027

TABLE B-7.3

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1978

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	9654	14	17.4	26	5	13.6	34	1.282	65%	1.196	97%
R:M:C	885	19	23.9	29	8	18.9	32	1.267	89%	1.190	3%
F:M:C	269	38	38.1	38	13	31.0	56	1.231	100%	1.142	100%

TABLE B-7.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1978

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR= @	EPA=	GPMR= @	EPA=	
R:A:C	GPMR = 1.125 + .0088(E)	.115	.224	1.24	14	1.35	26	.609 - 3.262
R:M:C	GPMR = .931 + .0138(E)	.174	.241	1.19	19	1.33	29	.801 - 3.550
F:M:C	DATASET NOT REGRESSIBLE				38		38	.679 - 3.027

TABLE B-7.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1979

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	9122	14	17.4	24	5	15.2	37	1.145	99%	1.174	92%
R:M:C	1270	18	22.1	25	9	20.3	34	1.094	100%	1.153	89%
F:M:C	204	32	32.1	32	23	31.3	43	1.027	100%	1.093	100%

TABLE B-7.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1979

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.138 + .0004(E)	.005	.190	1.14	14	1.15	24	.602 - 3.781
R:M:C	GPMR = .814 + .0126(E)	.138	.179	1.04	18	1.13	25	.693 - 2.095
F:M:C	DATASET NOT REGRESSIBLE				32		32	.745 - 1.428

TABLE B-7.7

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1980

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	6668	17	20.6	25	7	16.7	32	1.234	89%	1.209	28%
R:A:I	382	19	19.3	19	8	15.7	27	1.227	20%	1.188	96%
R:M:C	1394	22	26.0	29	10	20.9	34	1.247	100%	1.206	44%
F:M:C	417	29	29.8	30	11	28.3	43	1.057	100%	1.198	72%

TABLE B-7.8

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1980

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	ACTUAL GPMR RANGE
R:A:C	GPMR = .836 + .0192(E)	.187	.208	1.16	17	1.32	25	.644 - 3.115
R:A:I	GPMR = .266 + .0499(E)	.032	.210	1.20	19	1.23	19	.699 - 2.331
R:M:C	GPMR = .721 + .0201(E)	.188	.199	1.16	22	1.30	29	.734 - 2.745
F:M:C	GPMR = 3.230 - .0728(E)	.133	.193	1.12	29	1.05	30	.696 - 2.732

TABLE B-7.9

DATA BASE CHARACTERIZATION: FUEL ECONOMY INFLUENCES
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : FORD (MEASURED MPG), 1980

FUEL ECON INFLUENCE	VEHICLE TECHNOLOGY: R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	3386	4252	.	3752	.	.	.	.	.	2855	.	.
MILEPDAY	52	53	.	47	.	.	.	.	.	45	.	.
PCT.CITY	54	53	.	51	.	.	.	.	.	50	.	.
POPUDENS	8519	8907	.	8506	.	.	.	.	.	8374	.	.
TEMPTURE	56	52	.	55	.	.	.	.	.	57	.	.
WIND.MPH	10	11	.	10	.	.	.	.	.	10	.	.

INFLUENCE INDEXES	R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	1.08	1.06	.	1.07	.	.	.	.	.	1.10	.	.
MILEPDAY	1.02	1.01	.	1.02	.	.	.	.	.	1.01	.	.
PCT.CITY	1.00	.99	.	.99	.	.	.	.	.	.98	.	.
POPUDENS	1.01	1.01	.	1.01	.	.	.	.	.	1.01	.	.
TEMPTURE	1.00	1.02	.	1.01	.	.	.	.	.	1.00	.	.
CITYWIND	1.01	1.01	.	1.01	.	.	.	.	.	1.01	.	.
HWAYWIND	1.06	1.06	.	1.06	.	.	.	.	.	1.06	.	.
TPOGRAFY	1.01	1.00	.	1.02	.	.	.	.	.	1.01	.	.
HWYSPEED	1.02	1.02	.	1.02	.	.	.	.	.	1.02	.	.
CITYROAD	1.06	1.06	.	1.06	.	.	.	.	.	1.06	.	.
HWAYROAD	1.07	1.07	.	1.07	.	.	.	.	.	1.07	.	.
---------	-----	-----	.	-----	.	.	.	.	.	-----	.	.
TOTINFLU	1.21	1.19	.	1.21	.	.	.	.	.	1.20	.	.

TABLE B-8.1

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@	INFLU INDEX	INFLU SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	7037	11	17.8	32	7	14.9	38	1.206	100%	1.165	97%
R:A:I	157	15	18.1	29	8	14.7	31	1.223	93%	1.180	53%
R:A:D	239	22	25.8	30	13	23.2	40	1.112	100%	1.093	100%
R:M:C	1151	14	25.4	42	9	22.3	59	1.146	100%	1.171	13%
R:M:I	120	19	26.1	32	14	23.9	49	1.094	100%	1.116	100%
R:M:D	23	30	30.8	31	24	29.6	35	1.043	100%	1.133	77%
F:A:C	891	10	19.4	32	6	16.3	37	1.199	82%	1.227	100%
F:A:I	91	17	18.8	28	9	15.9	30	1.170	63%	1.208	90%
F:A:D	66	25	25.2	26	16	20.8	32	1.210	66%	1.181	35%
F:M:C	449	24	30.1	41	16	28.4	46	1.064	100%	1.170	3%
F:M:I	78	21	28.6	32	17	27.4	37	1.044	100%	1.174	15%
F:M:D	55	32	40.6	47	24	38.1	49	1.067	100%	1.086	100%

TABLE B-8.2

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), ALL YEARS

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.010 + .0106(E)	.186	.200	1.13	11	1.35	32	.641 - 2.409
R:A:I	GPMR = 1.565 - .0185(E)	.250	.221	1.29	15	1.03	29	.714 - 2.089
R:A:D	GPMR = 1.198 - .0033(E)	.038	.152	1.12	22	1.10	30	.731 - 1.828
R:M:C	GPMR = .942 + .0077(E)	.217	.186	1.05	14	1.27	42	.713 - 2.627
R:M:I	GPMR = .930 + .0061(E)	.167	.160	1.05	19	1.13	32	.667 - 1.622
R:M:D	GPMR = .465 + .0187(E)	.118	.111	1.02	30	1.05	31	.885 - 1.332
F:A:C	GPMR = 1.100 + .0046(E)	.134	.194	1.15	10	1.25	32	.678 - 2.021
F:A:I	GPMR = 1.426 - .0133(E)	.202	.210	1.20	17	1.05	28	.801 - 1.860
F:A:D	GPMR = 1.408 - .0078(E)	.035	.169	1.21	25	1.20	26	.828 - 1.586
F:M:C	GPMR = .777 + .0094(E)	.270	.146	1.00	24	1.16	41	.672 - 1.815
F:M:I	GPMR = .683 + .0126(E)	.238	.108	.95	21	1.08	32	.815 - 1.297
F:M:D	GPMR = 1.024 + .0011(E)	.048	.115	1.06	32	1.07	47	.835 - 1.357

TABLE B-8.3

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1975

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	1883	11	15.0	24	7	13.1	31	1.152	99%
R:M:C	172	14	20.8	24	10	19.6	32	1.064	100%
F:A:C	151	10	12.5	13	6	11.2	16	1.116	90%

TABLE B-8.4

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1975

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG GPMR=	@ EPA=	GPMR=	@ EPA=	ACTUAL GPMR RANGE
R:A:C	GPMR = 1.089 + .0041(E)	.056	.192	1.13	11	1.18	24	.641 - 2.409
R:M:C	GPMR = .965 + .0046(E)	.087	.173	1.03	14	1.08	24	.723 - 1.663
F:A:C	GPMR = .409 + .0563(E)	.110	.181	.96	10	1.14	13	.754 - 1.717

TABLE B-8.5

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1976

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF@
		MIN	HMAV	MAX	MIN	HMAV	MAX		
R:A:C	1311	12	17.0	29	7	13.9	30	1.224	99%
R:A:I	73	15	16.4	17	8	12.6	17	1.311	100%
R:M:C	319	14	24.6	33	9	21.4	33	1.158	100%
F:A:C	100	12	13.8	14	8	11.5	16	1.194	64%

TABLE B-8.6

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1976

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.089 + .0077(E)	.128	.210	1.18	12	1.31	29	.740 - 2.248
R:A:I	GPMR = .473 + .0508(E)	.182	.225	1.23	15	1.33	17	.932 - 2.089
R:M:C	GPMR = .943 + .0084(E)	.244	.171	1.06	14	1.22	33	.744 - 1.818
F:A:C	GPMR = .640 + .0401(E)	.152	.168	1.11	12	1.21	14	.889 - 1.729

TABLE B-8.7

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1978

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++ MIN	HMAV	MAX	+++ ROAD MPG +++ MIN	HMAV	MAX	GPM RATIO	GPMR SIGNF DIFF*
R:A:C	1433	13	19.2	27	8	15.8	30	1.218	38%
R:A:D	38	22	24.1	24	18	21.2	26	1.134	100%
R:M:C	51	17	30.8	34	13	24.1	36	1.296	96%

TABLE B-8.8

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1978

VEHICLE TECHNOL	REGRESSION EQUATION E = EPA 55/45 MPG	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG				ACTUAL GPMR RANGE
				GPMR=	@ EPA=	GPMR=	@ EPA=	
R:A:C	GPMR = 1.020 + .0101(E)	.137	.182	1.15	13	1.29	27	.804 - 2.361
R:A:D	GPMR = 1.817 - .0283(E)	.173	.102	1.19	22	1.13	24	.947 - 1.341
R:M:C	GPMR = .804 + .0155(E)	.283	.254	1.07	17	1.33	34	.845 - 2.627

TABLE B-8.9

DATA BASE CHARACTERIZATION: FUEL ECONOMY INFLUENCES
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1978

FUEL ECON INFLUENCE	VEHICLE TECHNOLOGY: R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	6426		11309	6830								
MILEPDAY	48		66	41								
PCT.CITY(*)	55		55	55								
POPUDENS	4679		5844	4564								
TEMPTURE	64		71	62								
WIND.MPH	9		8	9								

INFLUENCE INDEXES	R:A:C	R:A:D	R:M:C
ODOMETER	1.01	.99	1.01
MILEPDAY	1.03	.96	1.03
PCT.CITY(*)	1.00	1.00	1.00
POPUDENS	.99	.99	.99
TEMPTURE	.97	.94	.97
CITYWIND	1.01	1.01	1.01
HWAYWIND	1.05	1.05	1.05
TPOGRAFY	1.01	1.03	1.03
HWYSPEED	1.02	1.02	1.01
CITYROAD	1.05	1.04	1.05
HWAYROAD	1.06	1.06	1.06
TOTINFLU	1.10	.99	1.12

55% CITY ASSUMED; NOT IN DATA BASE.

TABLE B-8.10

IN-USE FUEL ECONOMY OFFSET: NON-MODAL CONSTANT-FACTOR ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1980

VEHICLE TECHNOL	NUMBER OF VEH	+++ EPA MPG +++			+++ ROAD MPG +++			GPM RATIO	GPMR SIGNF DIFF*	INFLU INDEX	INFLU SIGNF DIFF*
		MIN	HMAV	MAX	MIN	HMAV	MAX				
R:A:C	2410	15	20.5	32	8	16.7	38	1.232	100%	1.199	89%
R:A:I	84	18	19.9	29	11	17.3	31	1.147	93%	1.173	61%
R:A:D	201	25	26.2	30	13	23.7	40	1.107	100%	1.111	100%
R:M:C	609	16	27.1	42	12	23.6	59	1.150	100%	1.176	93%
R:M:I	120	19	26.1	32	14	23.9	49	1.094	100%	1.116	100%
R:M:D	23	30	30.8	31	24	29.6	35	1.043	100%	1.133	84%
F:A:C	640	18	24.1	32	10	19.8	37	1.219	100%	1.249	100%
F:A:I	91	17	18.8	28	9	15.9	30	1.170	55%	1.208	51%
F:A:D	66	25	25.2	26	16	20.8	32	1.210	73%	1.181	32%
F:M:C	449	24	30.1	41	16	28.4	46	1.064	100%	1.170	98%
F:M:I	78	21	28.6	32	17	27.4	37	1.044	100%	1.174	60%
F:M:D	55	32	40.6	47	24	38.1	49	1.067	100%	1.086	100%

TABLE B-8.11

IN-USE FUEL ECONOMY OFFSET: NON-MODAL MPG-DEPENDENT ANALYSIS
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1980

VEHICLE TECHNOL	REGRESSION EQUATION	R-VALUE	STD ERR	SOLUTIONS AT MIN/MAX EPA MPG GPMR=	@EPA=	GPMR=	@EPA=	ACTUAL GPMR RANGE
R:A:C	GPMR = .972 + .0125(E)	.162	.209	1.162	15	1.369	32	.677 - 2.058
R:A:I	GPMR = 1.271 - .0061(E)	.098	.200	1.161	18	1.093	29	.714 - 1.657
R:A:D	GPMR = 1.112 - .0002(E)	.002	.159	1.108	25	1.107	30	.731 - 1.828
R:M:C	GPMR = 1.063 + .0031(E)	.083	.184	1.114	16	1.195	42	.713 - 1.935
R:M:I	GPMR = .930 + .0061(E)	.167	.160	1.045	19	1.128	32	.667 - 1.622
R:M:D	GPMR = .465 + .0187(E)	.118	.111	1.022	30	1.054	31	.885 - 1.332
F:A:C	GPMR = 1.329 - .0045(E)	.065	.198	1.250	18	1.183	32	.678 - 2.021
F:A:I	GPMR = 1.426 - .0133(E)	.202	.210	1.203	17	1.054	28	.801 - 1.960
F:A:D	GPMR = 1.408 - .0078(E)	.035	.169	1.215	25	1.203	26	.828 - 1.586
F:M:C	GPMR = .777 + .0094(E)	.270	.146	1.005	24	1.161	41	.672 - 1.815
F:M:I	GPMR = .683 + .0126(E)	.238	.108	.948	21	1.084	32	.815 - 1.297
F:M:D	GPMR = 1.024 + .0011(E)	.048	.115	1.058	32	1.074	47	.835 - 1.357

TABLE B-8.12

DATA BASE CHARACTERIZATION: FUEL ECONOMY INFLUENCES
... 12 VEHICLE TECHNOLOGY STRATA ...

DATA SOURCE : GM (MEASURED MPG), 1980

FUEL ECON INFLUENCE	VEHICLE TECHNOLOGY: R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	3525	4885	4718	4082	5427	6037	2970	3610	3485	4184	5082	6814
MILEPDAY	44	43	58	48	44	52	38	38	42	49	40	58
PCT CITY	51	54	45	52	48	45	56	55	54	51	57	55
POPUDENS	4282	4606	4176	4080	4453	5177	4822	5338	4862	4388	4016	3588
TEMPTURE	54	56	57	53	57	52	53	54	57	52	53	59
WIND MPH	11	10	10	11	10	10	11	10	10	11	10	10

INFLUENCE INDEXES	R:A:C	R:A:I	R:A:D	R:M:C	R:M:I	R:M:D	F:A:C	F:A:I	F:A:D	F:M:C	F:M:I	F:M:D
ODOMETER	1.05	1.03	1.03	1.04	1.02	1.02	1.06	1.05	1.05	1.04	1.03	1.01
MILEPDAY	1.06	1.03	1.00	1.03	1.01	1.00	1.07	1.05	1.03	1.02	1.03	.98
PCT CITY	.99	1.00	.97	.99	.98	.97	1.00	1.00	1.00	.99	1.01	1.00
POPUDENS	.99	.99	.99	.99	1.00	1.00	.99	1.00	.99	.99	.99	.99
TEMPTURE	1.00	1.00	.99	1.01	1.00	1.02	1.01	1.01	1.00	1.01	1.01	.99
CITYWIND	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
HWAYWIND	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
TPOGRAFY	1.01	1.02	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.03	1.02	1.02
HWYSPEED	1.02	1.02	1.02	1.02	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02
CITYROAD	1.05	1.04	1.04	1.05	1.04	1.04	1.05	1.04	1.05	1.05	1.05	1.05
HWAYROAD	1.06	1.06	1.06	1.06	1.06	1.05	1.06	1.06	1.06	1.06	1.06	1.06
TOTINFLU	1.20	1.17	1.11	1.18	1.12	1.13	1.25	1.21	1.18	1.17	1.17	1.09

This page intentionally
blank and un-numbered

APPENDIX C

ANALYSIS OF PERCEIVED VS. MEASURED FUEL ECONOMY

This page intentionally
blank and un-numbered

APPENDIX C

Analysis of Perceived vs. Measured Fuel Economy

Two kinds of analysis were performed to investigate the detailed relationship between perceived fuel economy and measured fuel economy. The motivation behind this investigation was to assess whether perceived fuel economy data is appropriate for development of valid in-use MPG adjustment factors.

The Emission Factors Postcard Survey was used in the first analysis; it is the only data source which contains both perceived and measured fuel economies on the same cars. In the second analysis, the in-use fuel economy offsets of those data sources including only perceived data were compared to the offsets of the purely measured sources.

A. ANALYSIS OF EMISSION FACTORS POSTCARD SURVEY

The Emission Factors Postcard Survey used in this analysis contains data as of October 28, 1981 from the Fiscal Year 1979 and 1980 Emission Factors (EF) program. This data set contains data from 1011 vehicles from 14 manufacturers, seven different sites, and seven model years (1975-1981).

Measured/Perceived Fuel Economy Ratios

Measured/Perceived fuel economy ratios for each vehicle were calculated for both city and highway perceived MPG figures. These ratios are defined below:

$$\frac{M}{Pc} = \frac{\text{Measured MPG}}{\text{Perceived City MPG}}$$

$$\frac{M}{Ph} = \frac{\text{Measured MPG}}{\text{Perceived Highway MPG}}$$

Four different analyses were used to determine two-mode relationships between measured and perceived fuel economy from the EF Postcard data. A brief description of each analysis follows:

- Measured/Perceived Two-Mode Fuel Economy Ratios, regression approach - This analysis derived average Measured/Perceived fuel economy ratios, as defined above, for those vehicle technology strata in the EF Postcard data base. City M/P ratios and highway M/P ratios were extracted from the data by regressing against urban fraction.

- Measured/Perceived Two-mode Fuel Economy Ratios, mode-specific approach This analysis derived average Measured/Perceived FE ratios for those vehicles that were "city-driven" (75-100% urban fraction) and those that were "highway-driven" (0-25% urban fraction); this technique, as contrasted with the first analysis, does not use all of the data, but it does derive two-mode M/P factors directly rather than by regression against urban fraction.

- Histograms were run to illustrate distributions of △MPG (Perceived MPG - Measured MPG) and Measured/Perceived Ratios for both city and highway driving modes.

- MPG Dependence of City and Highway M/P Ratios - M/P ratios were derived for Low-MPG and High-MPG subsets of the "City" and "Highway" cars from the previous analysis, to determine whether the measured-to-perceived relationship exhibits a dependence on MPG level.

1. Regression Approach

Measured/Perceived ratios were regressed against urban fraction. The regression equations are listed in Table C-1 for four technology strata. Regressions for the individual fuel injection strata (RAI, RMI, FAI, FMI) are not presented since the sample sizes were too small. Instead, regression equations at the less specific "fuel injection" level are presented. The city and highway M/P ratios were determined by solving the regression equations as noted in the footnote in Table C-1.

Table C-1

Regressions of M/P Ratios Against Urban Fraction
(X = urban fraction)

City	Regression Equation	Solution*	F-STAT	SIGNIF
Overall	1.0813 - .0907X	1.00	1.6939	.1940
RAC	1.0438 - .0546X	.99	0.3004	.5843
RMC	1.2152 - .2760X	.99	2.7081	.1075
FAC	0.9823 - .0137X	.97	0.0101	.9205
FMC	1.2186 - .2152X	1.04	1.9352	.1751
Fuel Injection	0.9075 + .2009X	1.07	.2974	.5910
Highway				
Overall	0.9470 - .0853X	.94	0.2890	.5923
RAC	0.9405 - .1044X	.93	0.57031	.4540
RMC	(Average of M/P Ratios)**	.96		
FAC	0.8713 - .0492X	.87	0.0079	.9307
FMC	0.7355 + 1.088X	.94	1.2383	.2895
Fuel Injection	1.068 + .5832X	.96	2.4674	.1673

---

* Solutions based on the weighted average of the "0" and ".25" urban fraction levels for "highway" and the ".75" and "1" level for city.

** Not regressible since the independent variable, X, for all highway RMC's were equal.

2. Mode-Specific Approach

The M/P ratios determined by the second method (mode-specific vehicles) are given in Table C-2. Table C-2 contains M/P ratios that are mode-specific. That is, the average city M/P ratios are based on perceived fuel economy for cars with urban fractions between 0.75 and 1.00, while M/P highway ratios are based on perceived fuel economy for cars with urban fractions between 0 and 0.25. The city M/P ratios calculated using the urban specific approach shows, as did the first analysis, that perceived city fuel economy is not appreciably different from measured fuel economy for city driving, in most cases. The attained SIGNIF values are high, indicating these ratios are not significantly different from 1.00 (M/P = 1).

The highway M/P ratios still indicate overperception of in-use FE when compared against measured FE, in most instances. However, the sample sizes preclude definitive conclusions at high confidence about highway M/P ratios.

3. Histograms of △MPG and Measured/Perceived Fuel Economy Ratios

Histograms of M/P ratios and △MPG (Perceived MPG-Measured MPG) are shown as figures C-1 through C-12. This is important, since an underlying assumption used throughout these analyses was normality. The M/P histograms for both city and highway perceived MPG indicate the assumption of normality was not justified. The histograms for both city and highway M/P ratios indicate either positive kurtosis of the data -- a violation of the normality assumption -- or too few points for conclusive determination. The histograms of △MPG show the same types of patterns as those for M/P ratio.

Table C-2

Measured/Perceived Ratios - Mode Specific

	M/P Ratio	Sample Size	SIGNIF
City (.75-1.00 urban fraction)			
Overall	1.00	(332)	.6105
RAC	.99	(196)	.8046
RMC	.99	(43)	.5662
FAC	.99	(36)	.7275
FMC	1.03	(33)	.0863
Fuel Injection	1.07	(24)	.0611
Highway (0-.25 urban fraction)			
Overall	.93	(91)	.0000
RAC	.92	(48)	.0000
RMC	.96	(8)	.6177
FAC	.86	(14)	.0013
FMC	.99	(13)	.8424
Fuel Injection	.98	(8)	.6598

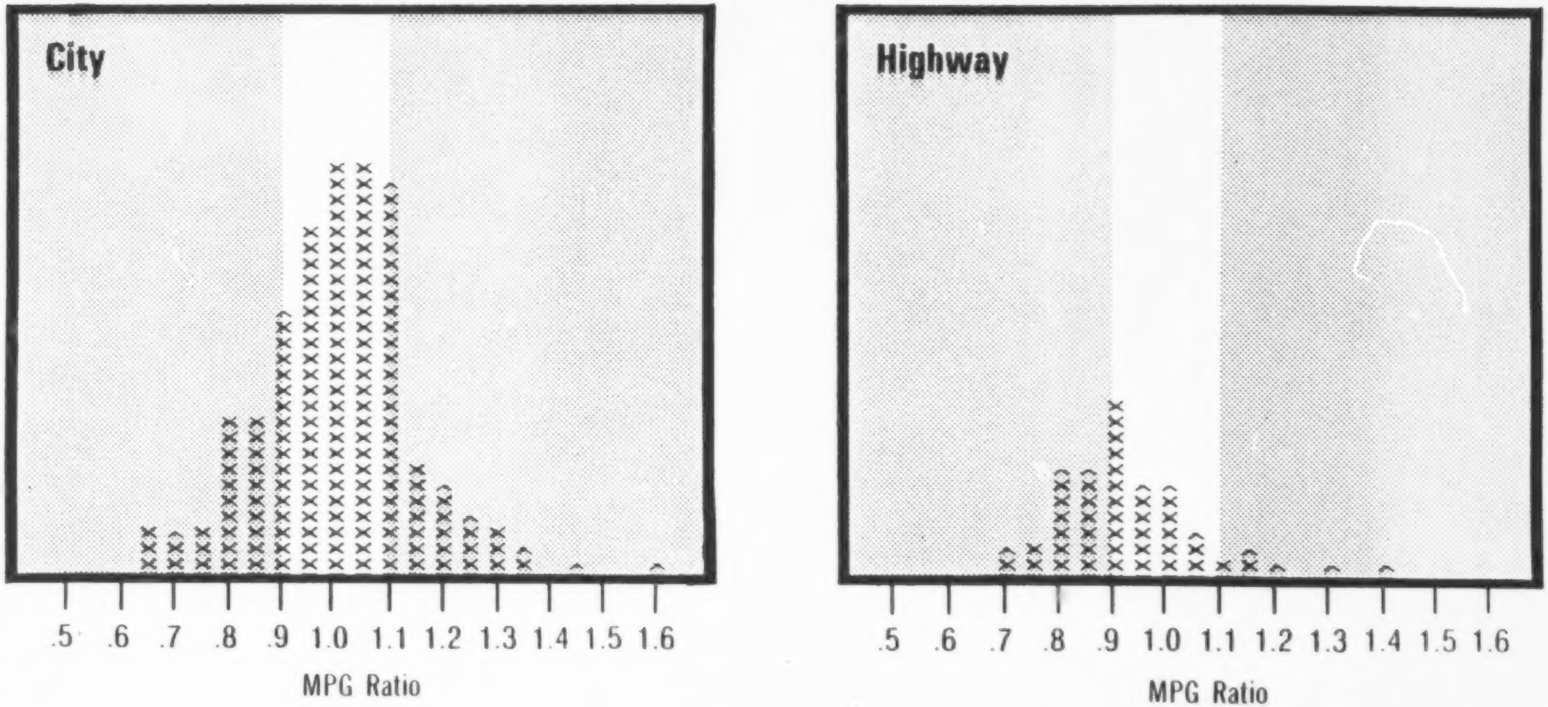


FIGURE
C–1

Histograms of Measured/Perceived Ratios:
ALL TECHNOLOGIES

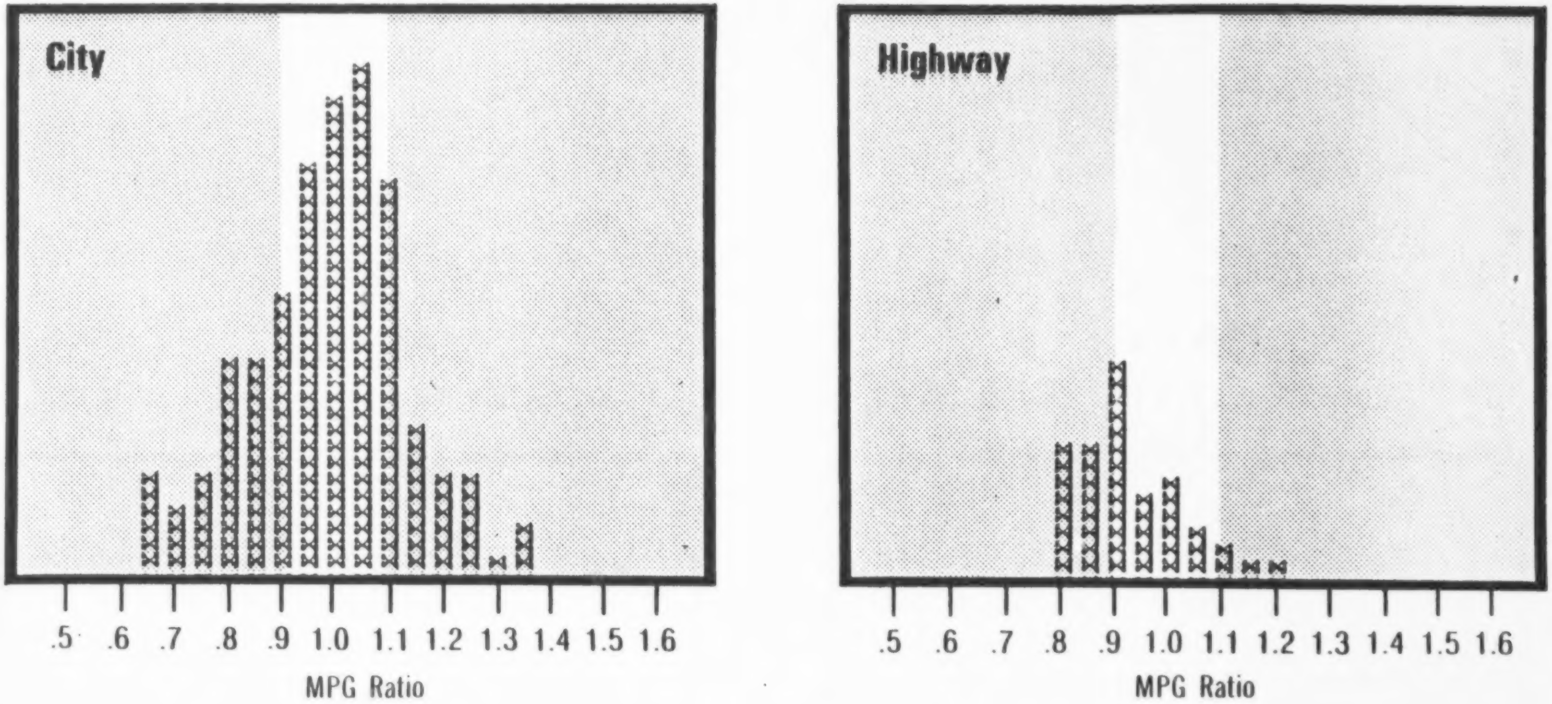


FIGURE
C–2

Histograms of Measured/Perceived Ratios: RAC

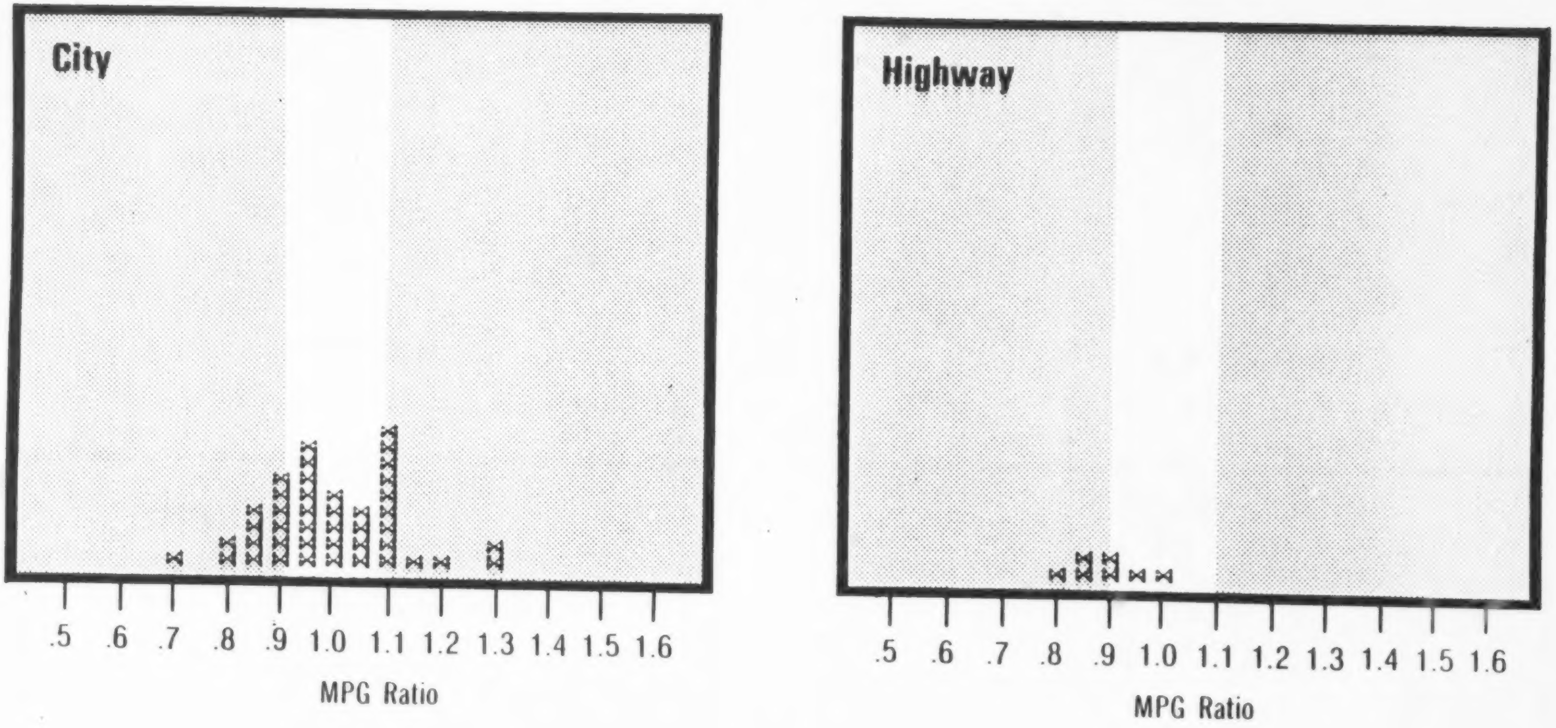


FIGURE
C—3

Histograms of Measured/Perceived Ratios: RMC

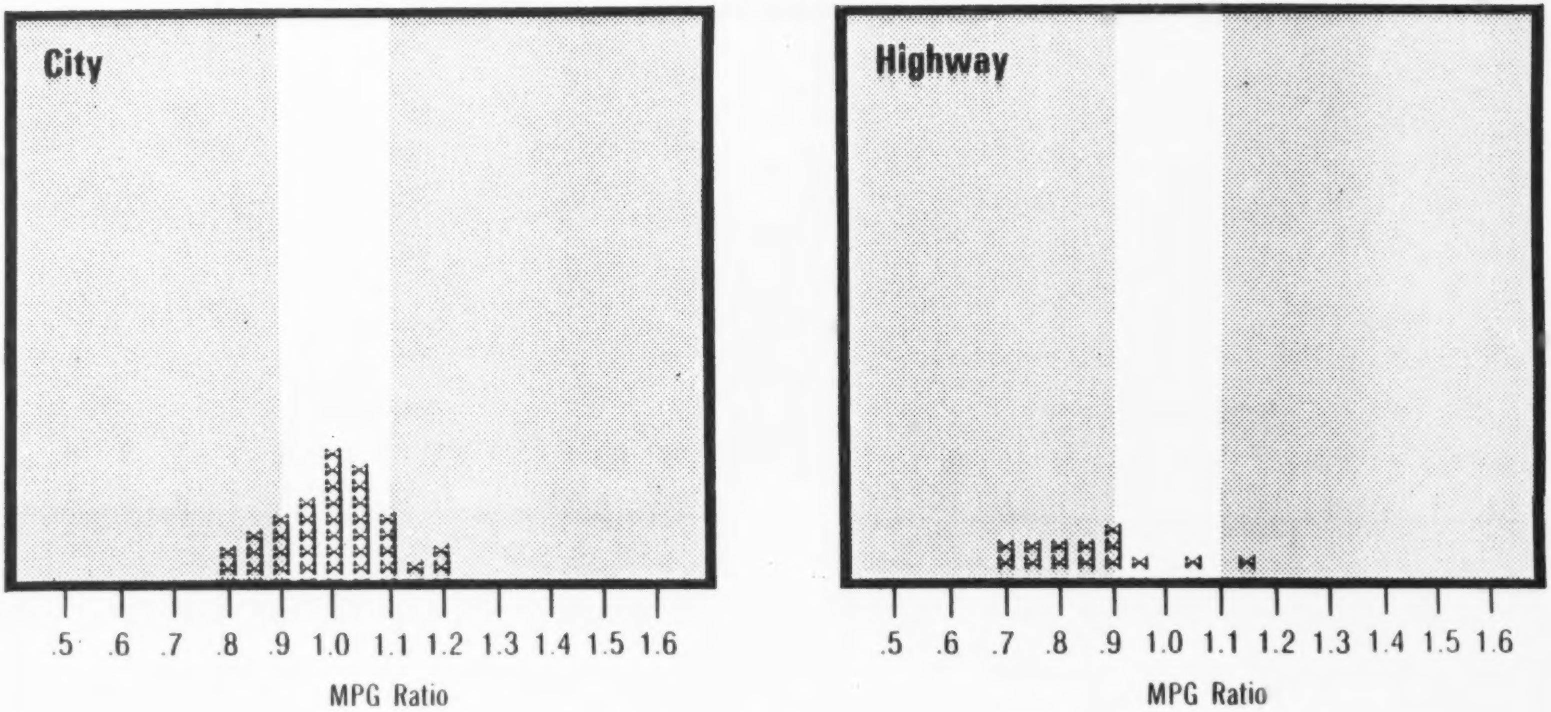


FIGURE
C—4

Histograms of Measured/Perceived Ratios: FAC

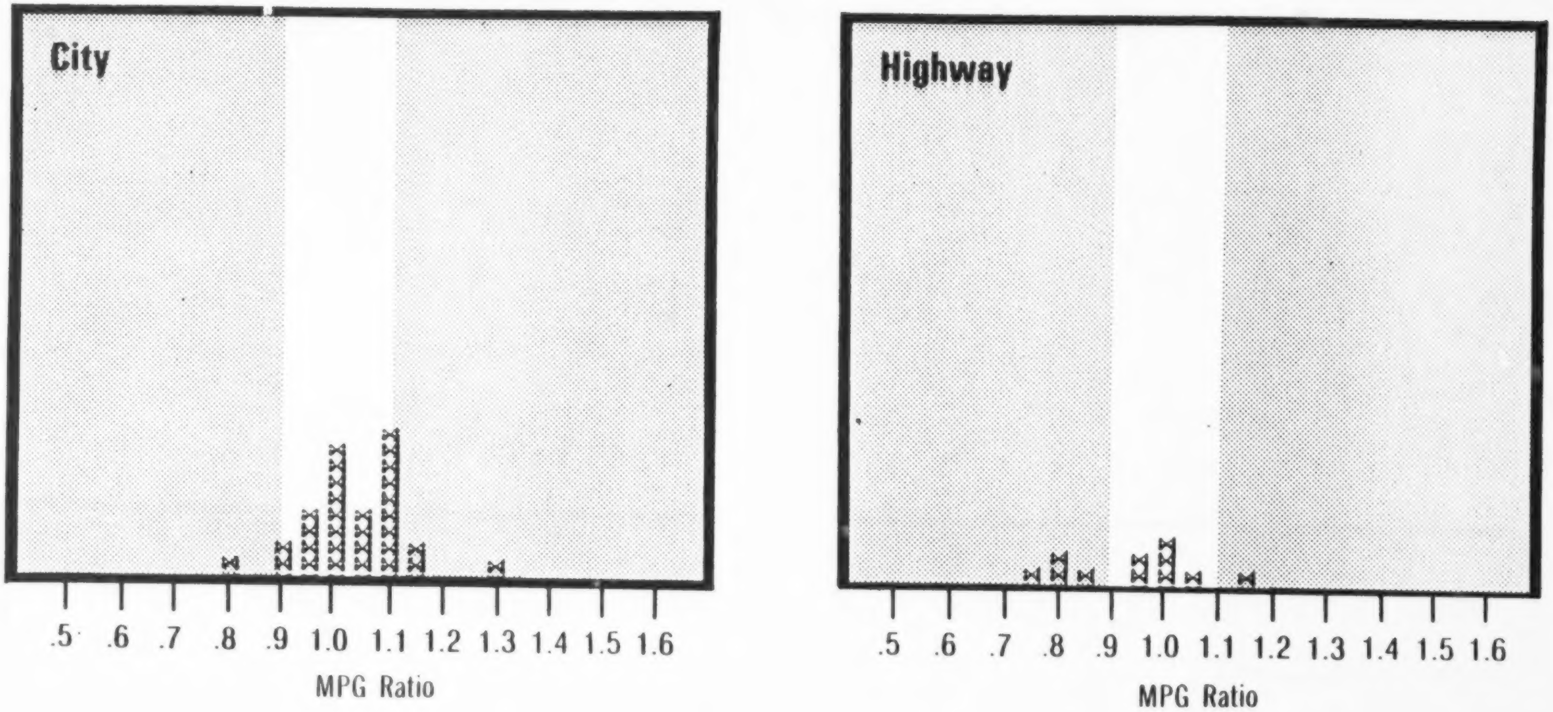


FIGURE
C–5

Histograms of Measured/Perceived Ratios: FMC

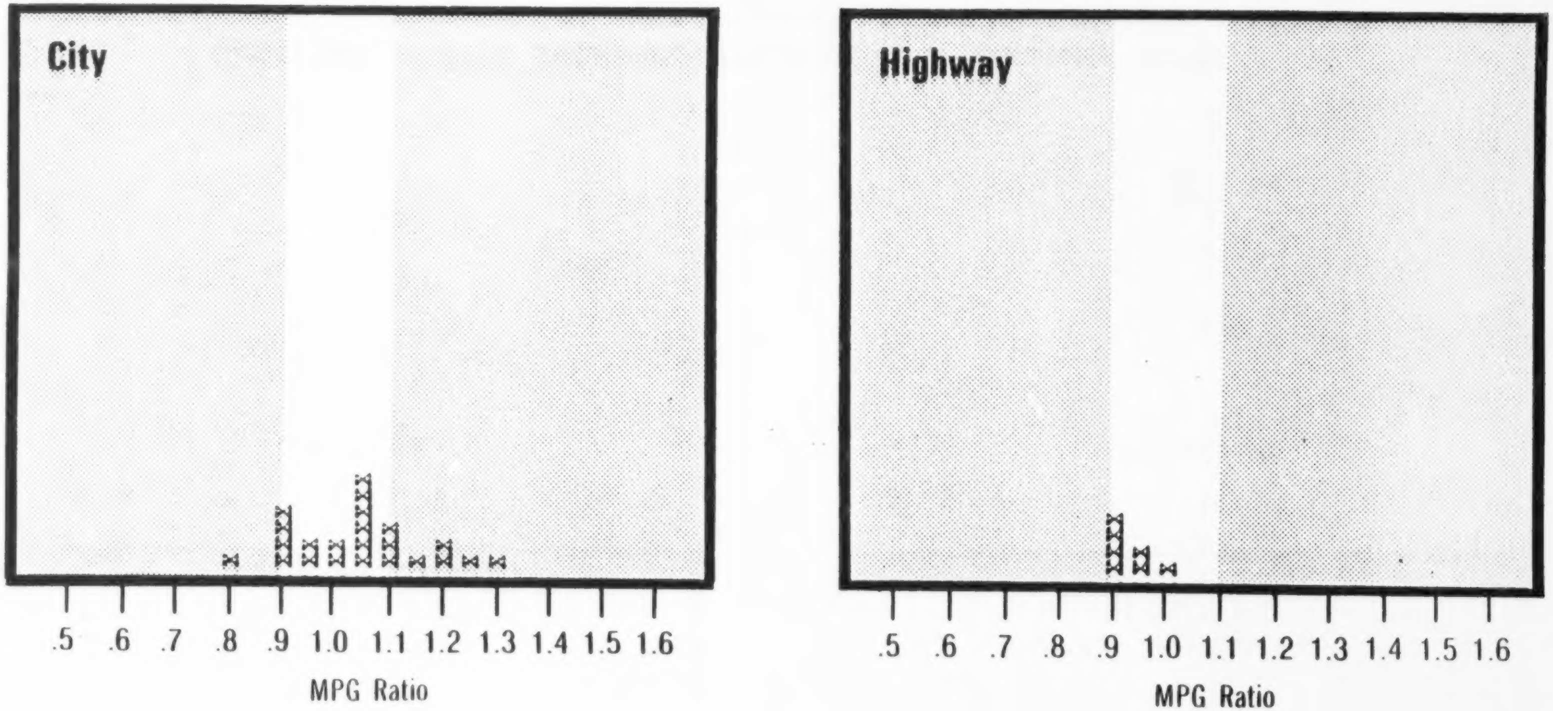


FIGURE
C—6

Histograms of Measured/Perceived Ratios:
FUEL INJECTION

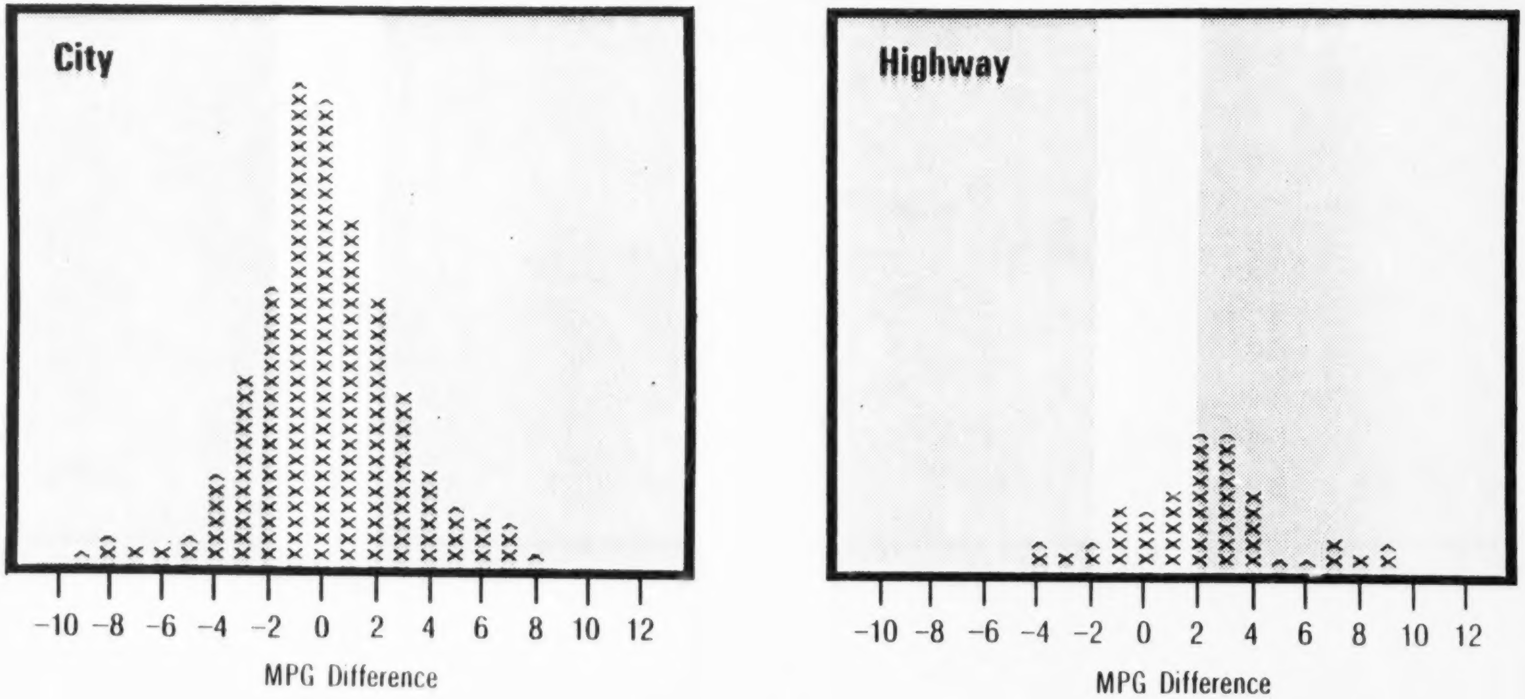


FIGURE
C–7 Histograms of MPG Difference (Perceived MPG–Measured MPG): ALL TECHNOLOGIES

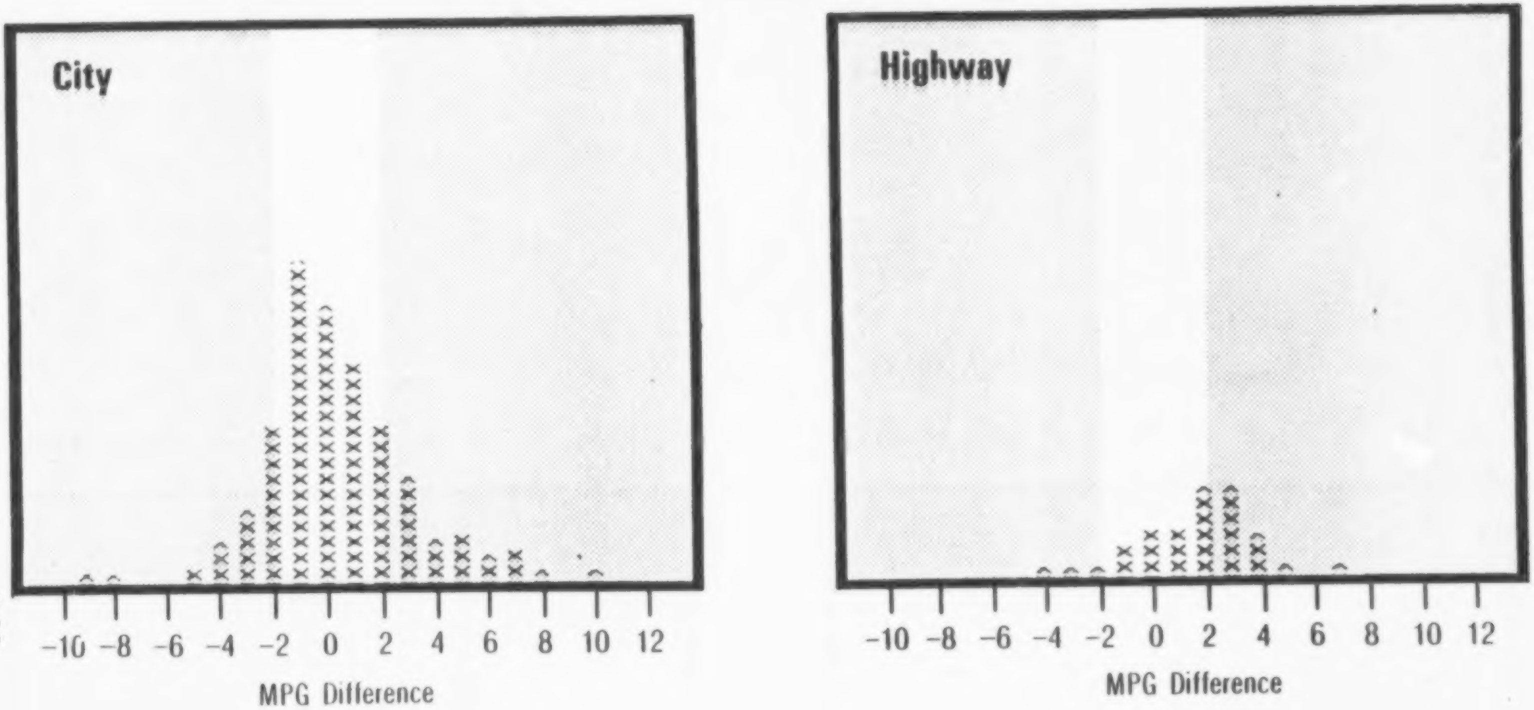
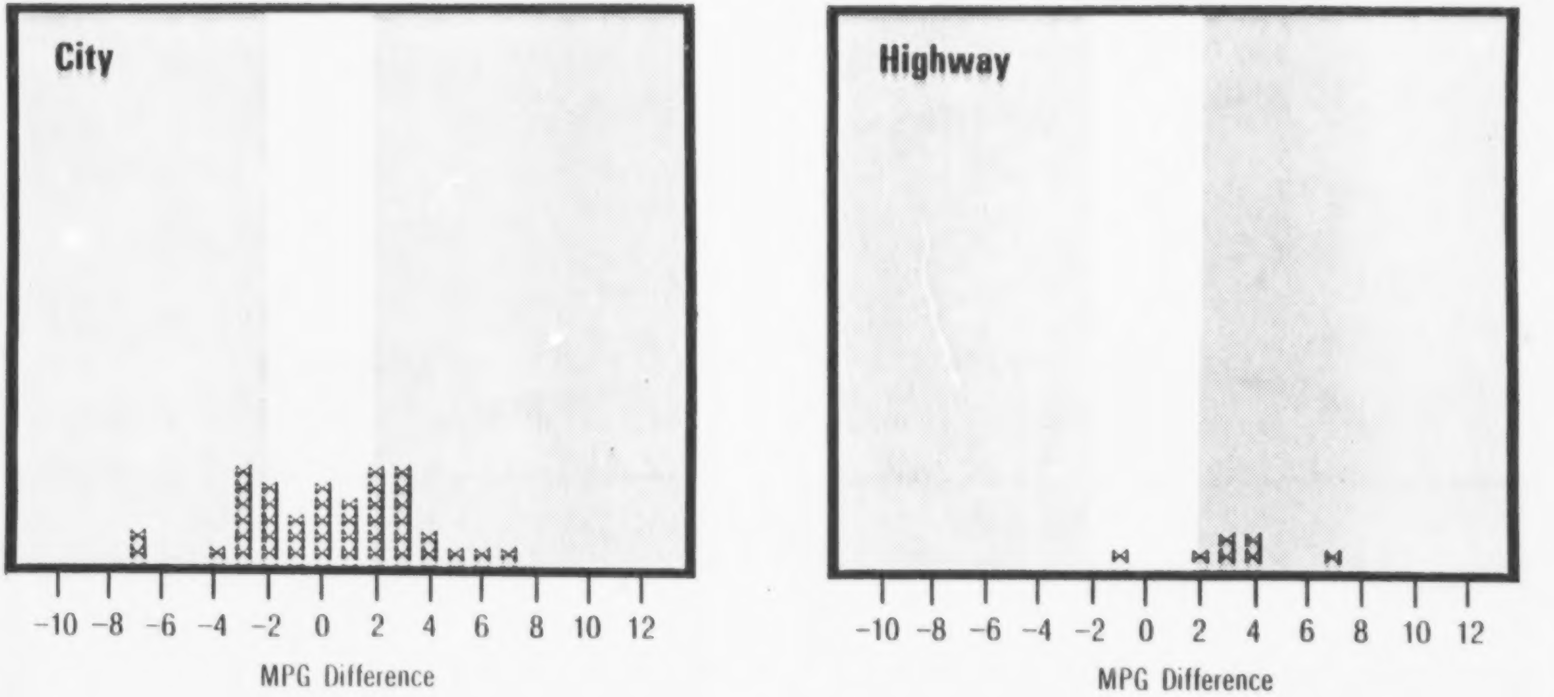


FIGURE
C–8 Histograms of MPG Difference (Perceived MPG–Measured MPG): RAC



FIGURE

C–9 Histograms of MPG Difference (Perceived MPG–Measured MPG): RMC

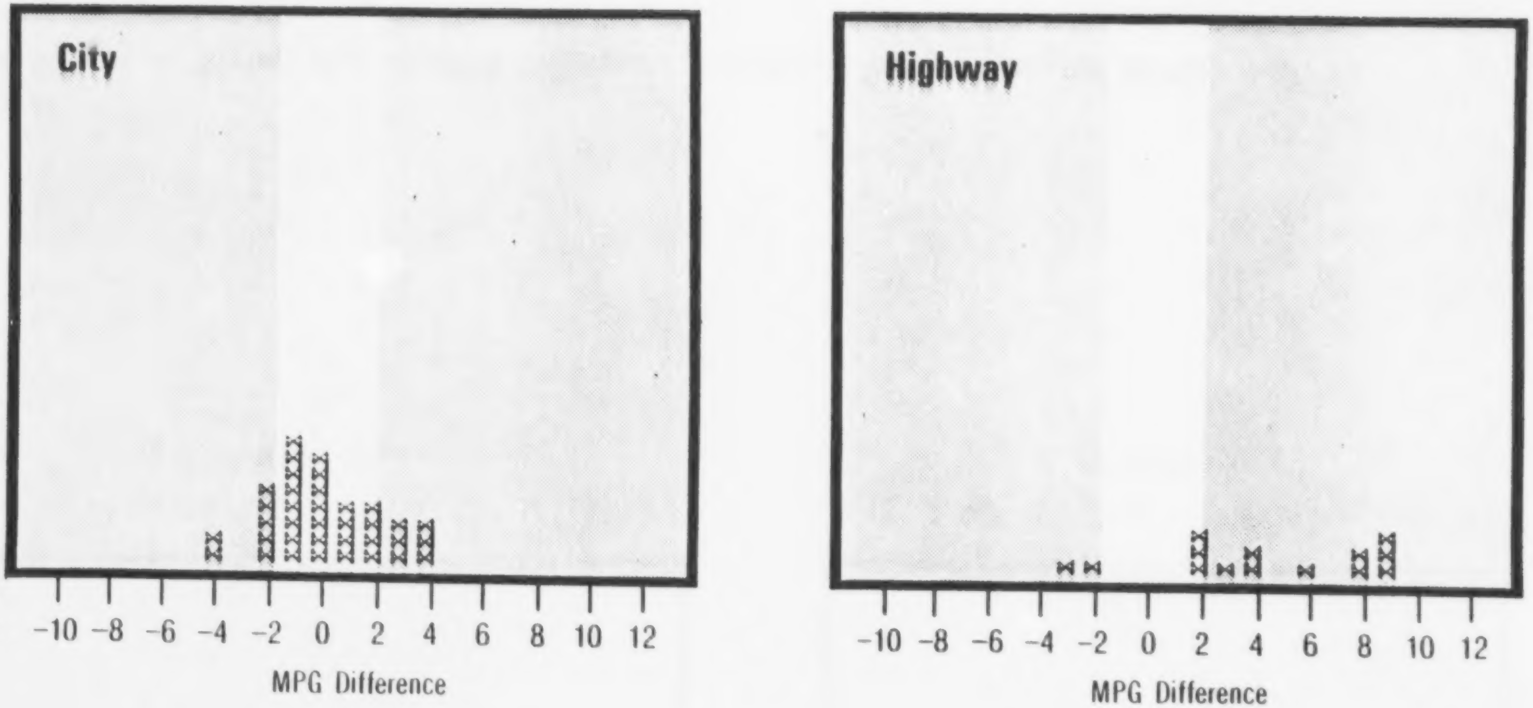


FIGURE
C–10 Histograms of MPG Difference (Perceived MPG–Measured MPG): FAC

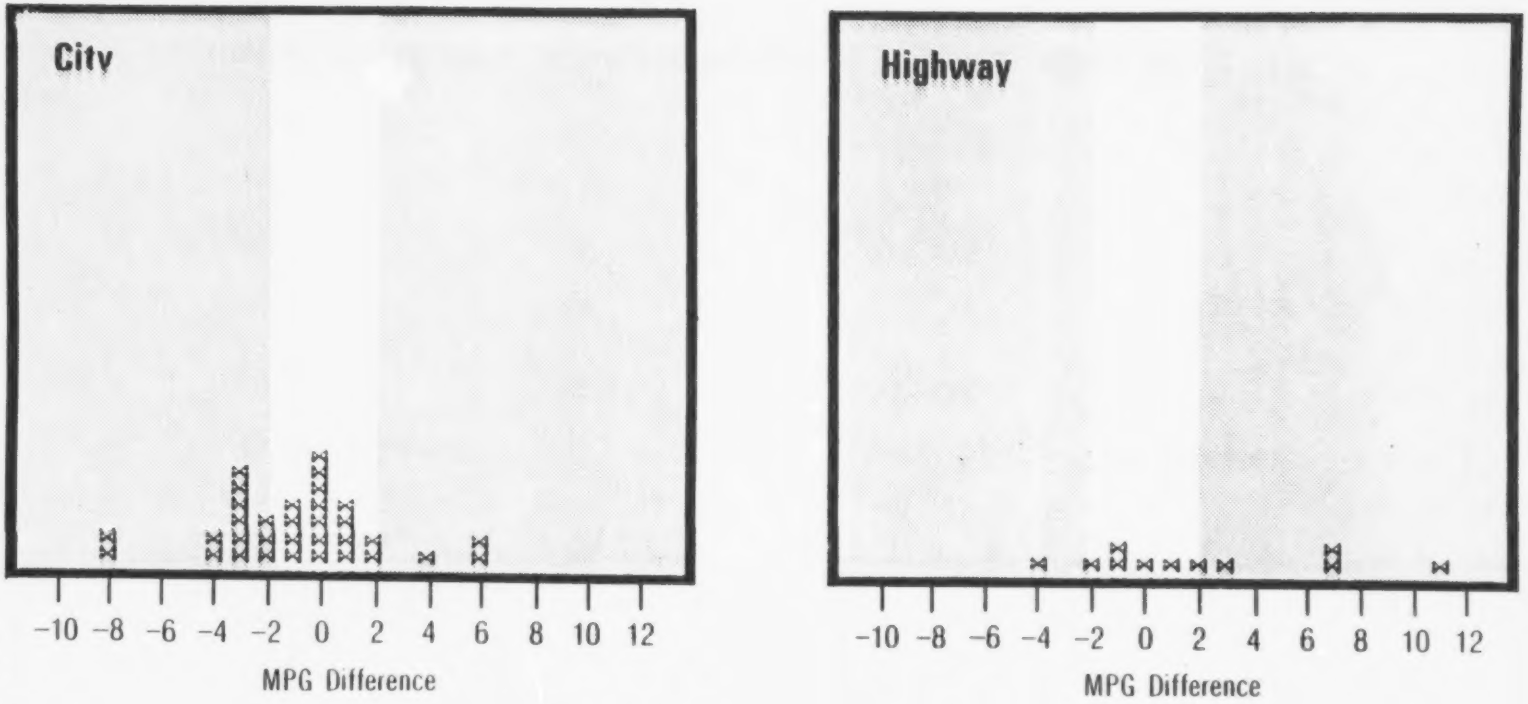
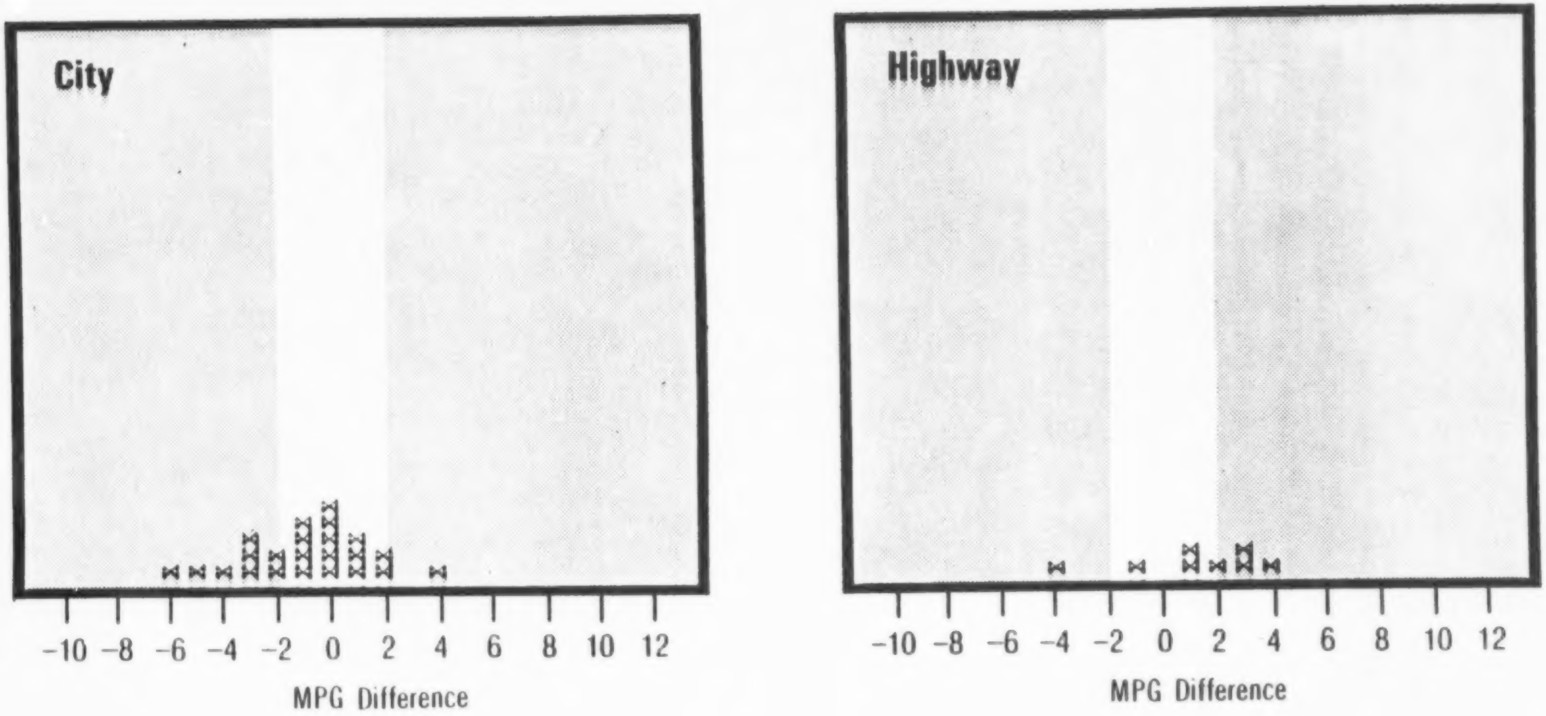


FIGURE
C–11 Histograms of MPG Difference (Perceived MPG–Measured MPG): FMC



FIGURE

C–12 Histograms of MPG Difference (Perceived MPG–Measured MPG): FUEL INJECTION

4. MPG Dependence

Table C-3 presents mode-specific M/P ratios split over low and high EPA MPG ranges to determine if MPG dependence exists. These M/P ratios were compared against the average urban specific M/P ratios from Table C-2 to determine if a significant difference was evident. The attained significances indicate no difference at a high confidence level, implying little if any MPG dependence for both city and highway M/P ratios. The large attained SIGNIF value could also be attributed to the small sample size for some strata levels.

Table C-3

MPG Dependence For Measured/Perceived Ratios

City	Low Range	N	M/P Ratio	SIGNIF*	High Range	N	M/P Ratio	SIGNIF*
Overall	8-17	177	.99	.5029	18-35	155	1.01	.2531
RAC	10-17	107	1.00	.8078	18-30	89	.99	.7658
RMC	15-24	18	.94	.1024	25-37	26	1.03	.1197
FAC	11-21	15	.96	.1228	22-31	21	1.02	.3217
FMC	20-27	13	1.02	.5416	28-39	20	1.04	.7760
Fuel Injection	9-17	11	1.07	.9313	18-27	13	1.06	.8876
Highway								
Overall	13-27	50	.91	.1565	28-50	40	.96	.2871
RAC	14-23	16	.90	.3517	24-38	32	.93	.5547
RMC	25-35	3	1.08	.6101	36-49	5	.90	.0131
FAC	16-29	3	.80	.3580	30-38	11	.88	.6858
FMC	30-39	8	1.05	.6705	40-51	5	.88	.1191
Fuel Injection	17-30	3	1.04	.7107	31-43	5	.94	.1888

---

* SIGNIF values presented are the attained SIGNIF for a two-sided t-test using the urban specific M/P ratios in Table C-2 as the null hypothesis (e.g., for overall city Ho: M/P = 1.00).

B. GENERAL ANALYSIS

Since the EF Postcard data base includes both perceived and measured MPG on the same cars*, it provided a basis for accurate comparison of the two figures. Unfortunately, the small size of that data base makes its statistical significance marginal, as was pointed out above. High technologies are particularly sparsely populated: there are less than 200 non-RAC cars with perceived MPG figures. Less than 30 of these are fuel injected, and there are no Diesels at all.

The other two sources of perceived MPG data (earlier Emission Factors and DOE/J.D. Power) lack the feature of including measured MPG along with the perceived figures, so no direct car-by-car comparison is possible. However, there are over 1100 non-RAC cars between these two sources; more than 300 of these are fuel injected, and there are 181 Diesels.

Hence it is important to look for perceived-to-measured relationships using data from these two sources. The method of inquiry necessarily involves comparing their results with the results of all of the measured-MPG sources.

Figures C-13 through C-23 are analysis-space plots of the perceived-MPG data averages, by vehicle technology class. Neither the perceived data nor the measured data are collapsed into single points for the comparison. The measured data are illustrated by shaded areas which enclose the average model type values for each separate data source and model year; two separate shaded areas are shown for each of the two groups of model years discussed earlier (1975 plus 1979-81, and 1976-78). Similarly, the two perceived data sources' averages are shown individually, with the same model year bifurcation as used for the measured data (the earlier Emission Factors perceived data are all from the 1976-78 group, and the DOE/Power data cover 1978 and 1979: one entry for each of the two model year groups.) This permits evaluation of each of the perceived source/year group cells against comparable measured source/year group results.

---

*Perceived MPG figures are not available for every car in the EF Postcard data base; less than 60% of the respondents gave perceived MPG figures.

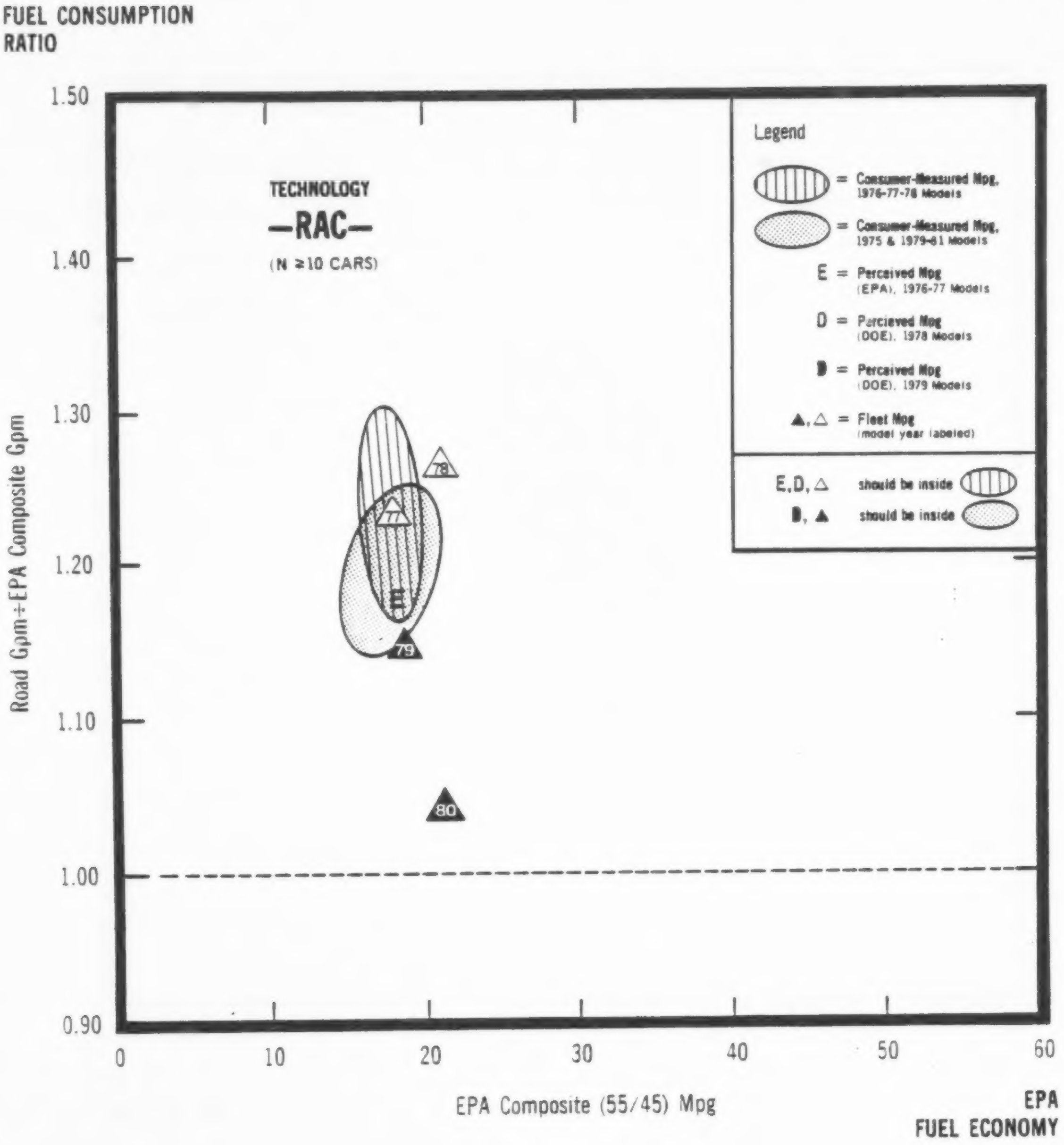


Figure
C—13

Perceived Mpg Data, Fleet Mpg Data, and Consumer-Measured Mpg Data for RAC Vehicles

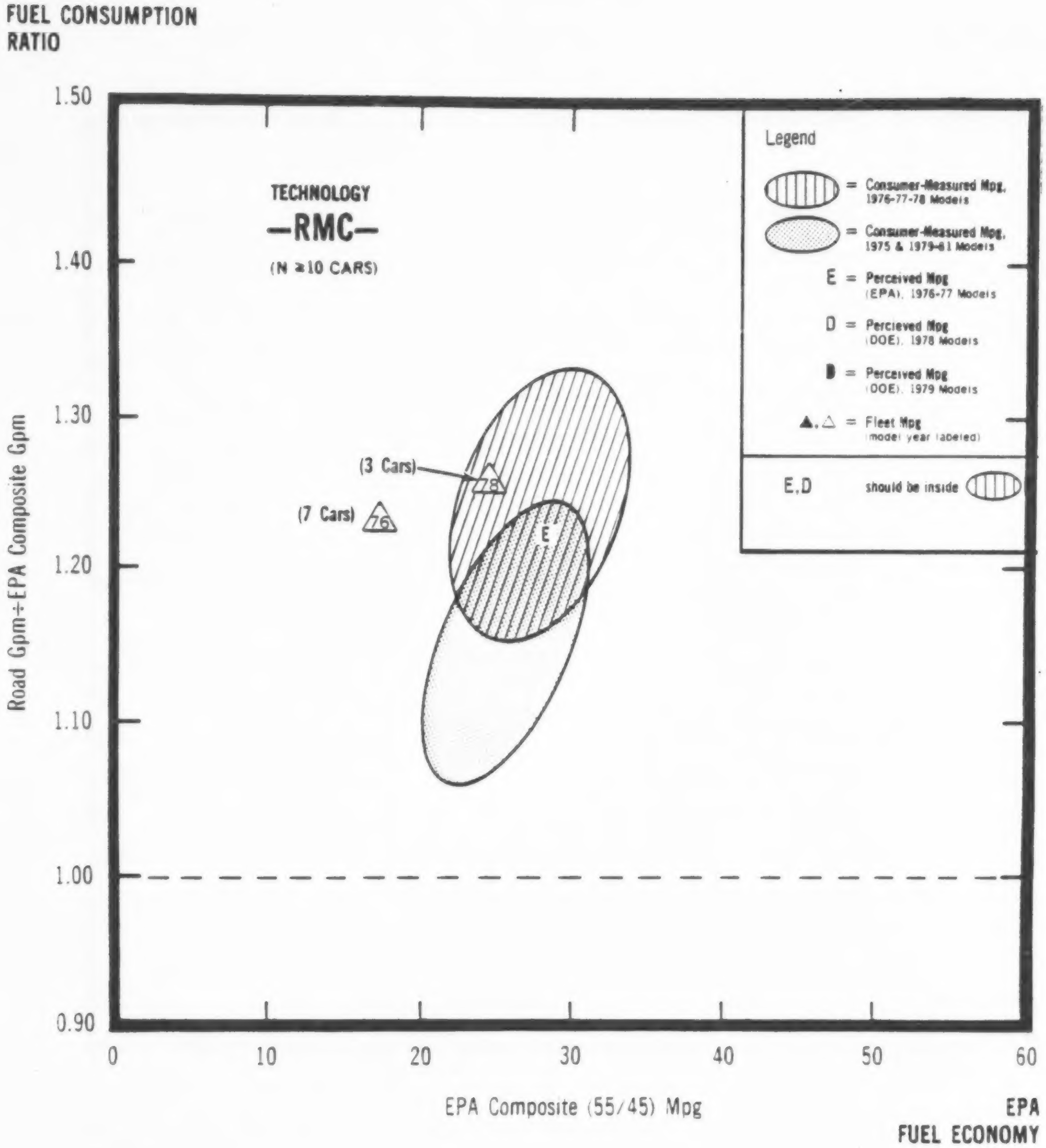


Figure
C—14

Perceived Mpg Data, Fleet Mpg Data, and Consumer-Measured Mpg Data for RMC Vehicles

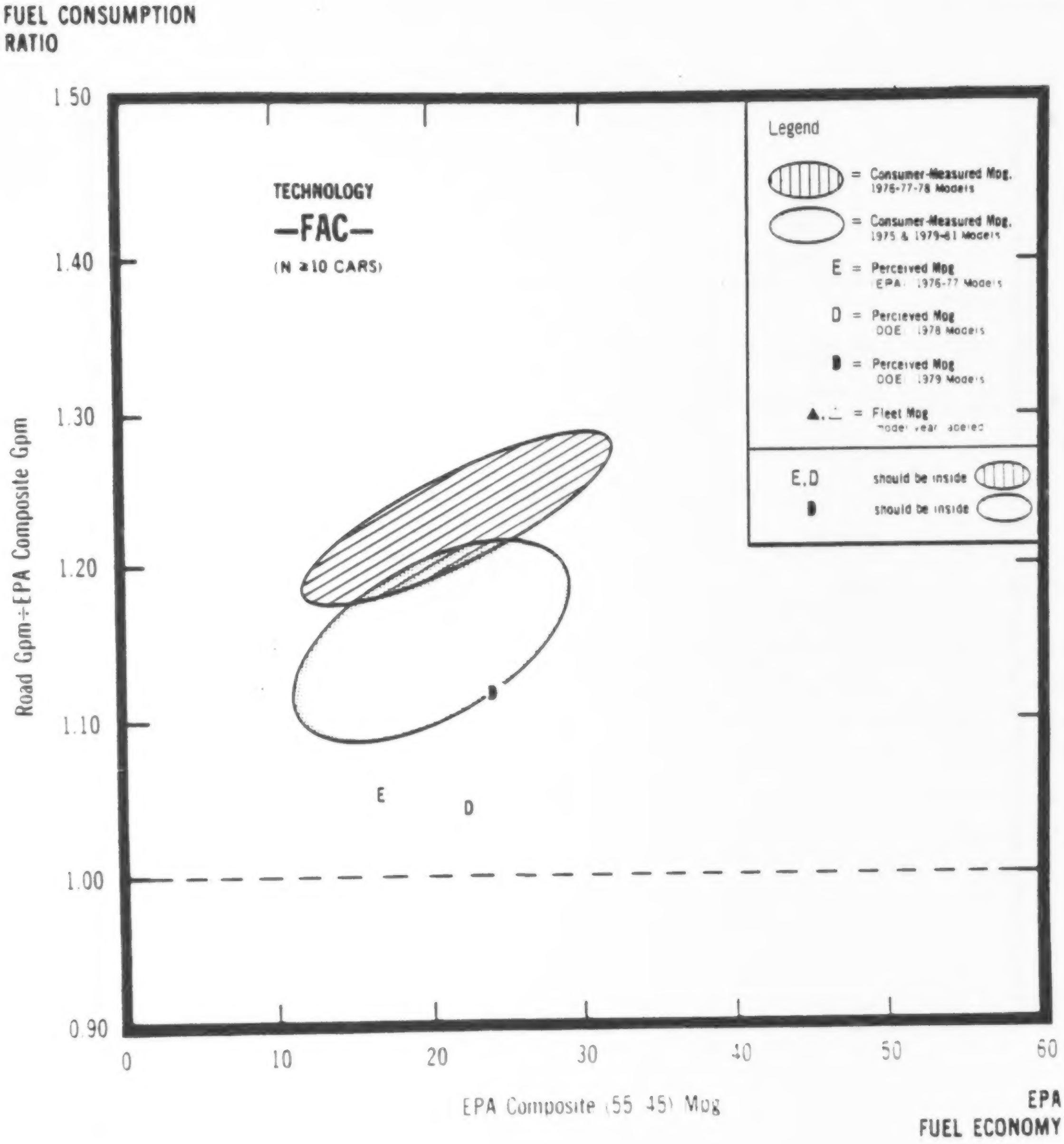
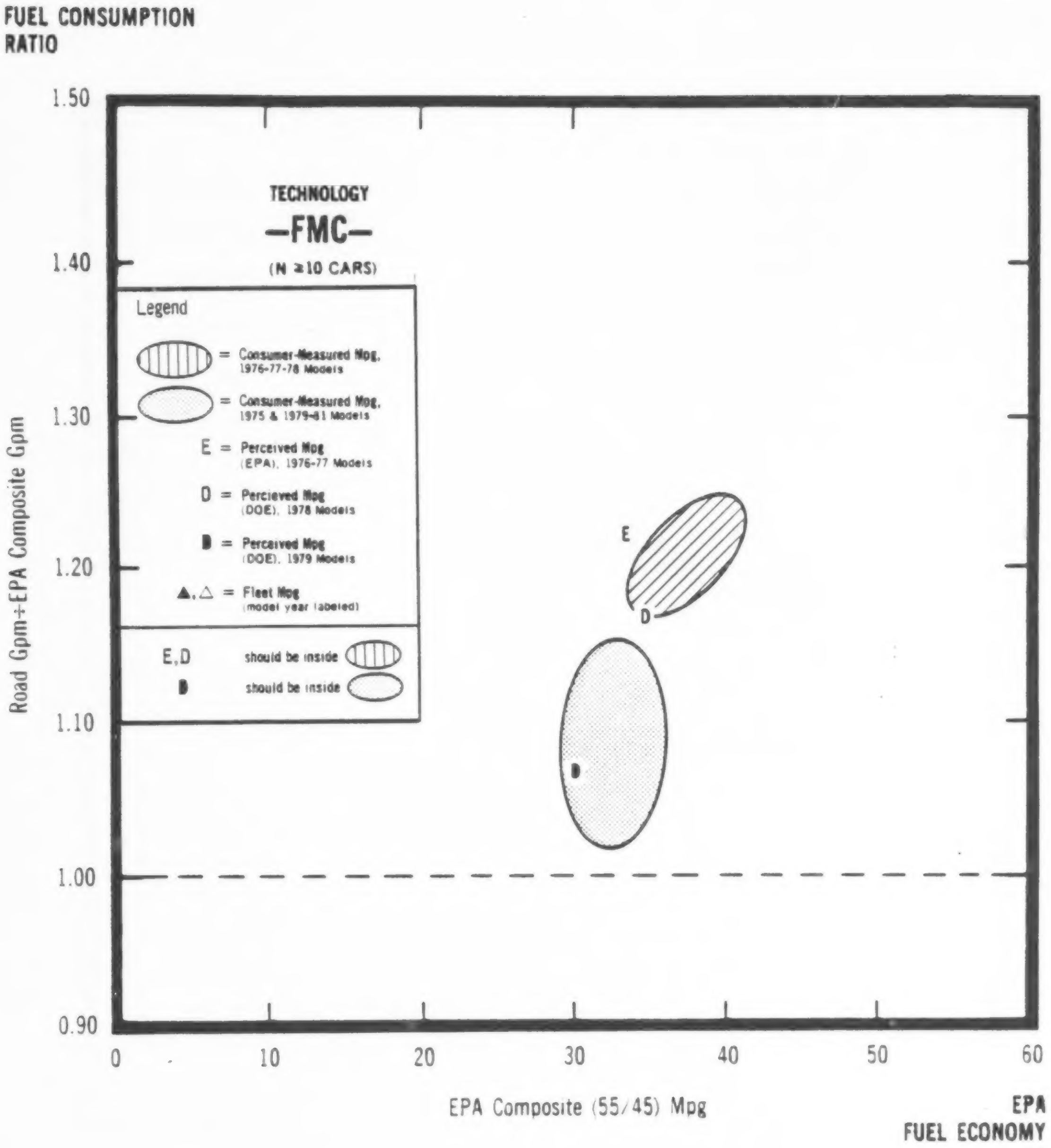


Figure
C—15

Perceived Mpg Data, and Consumer-Measured Mpg Data for FAC Vehicles



Figure

C–16

Perceived Mpg Data, and Consumer-Measured Mpg Data for FMC vehicles

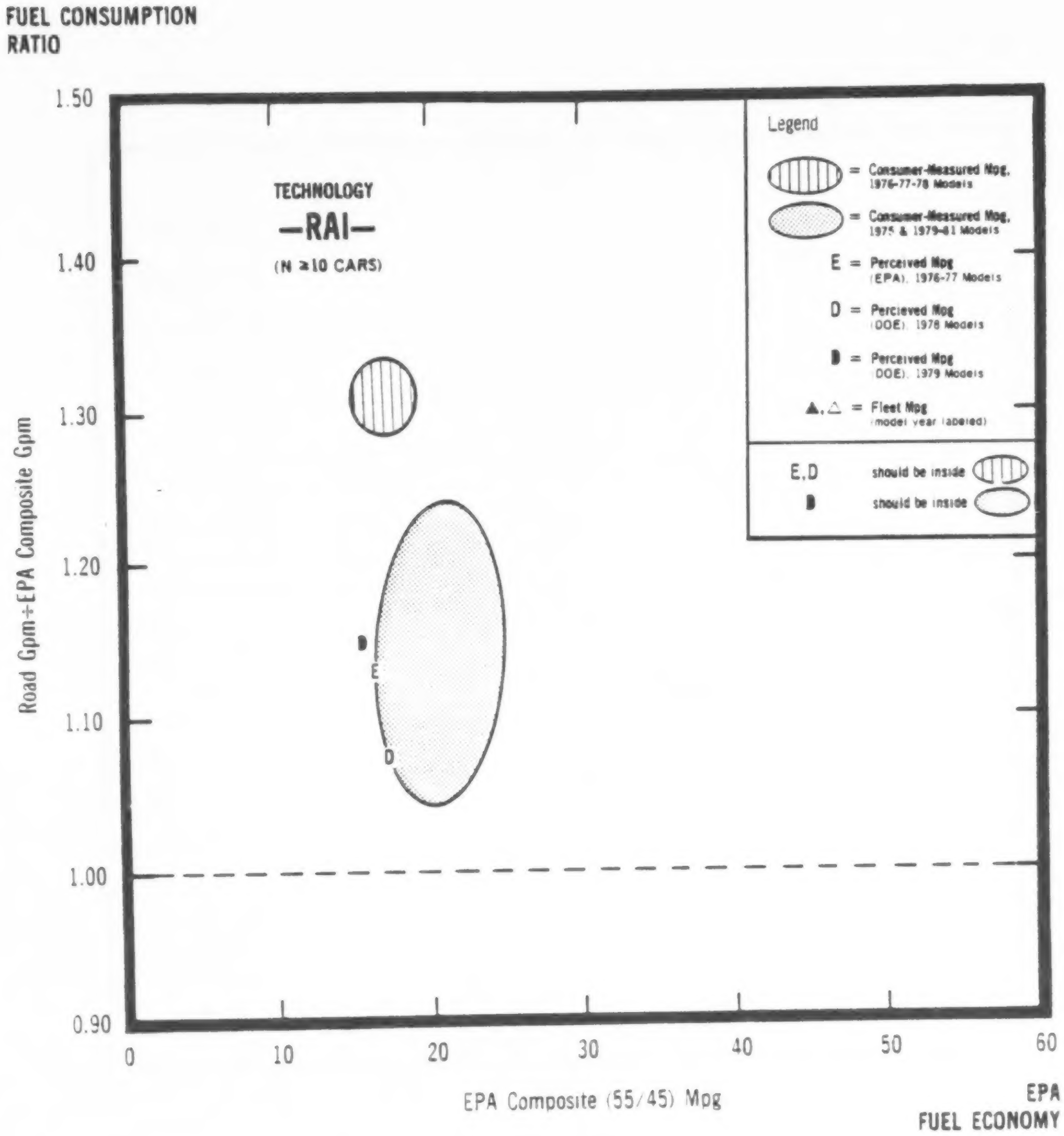
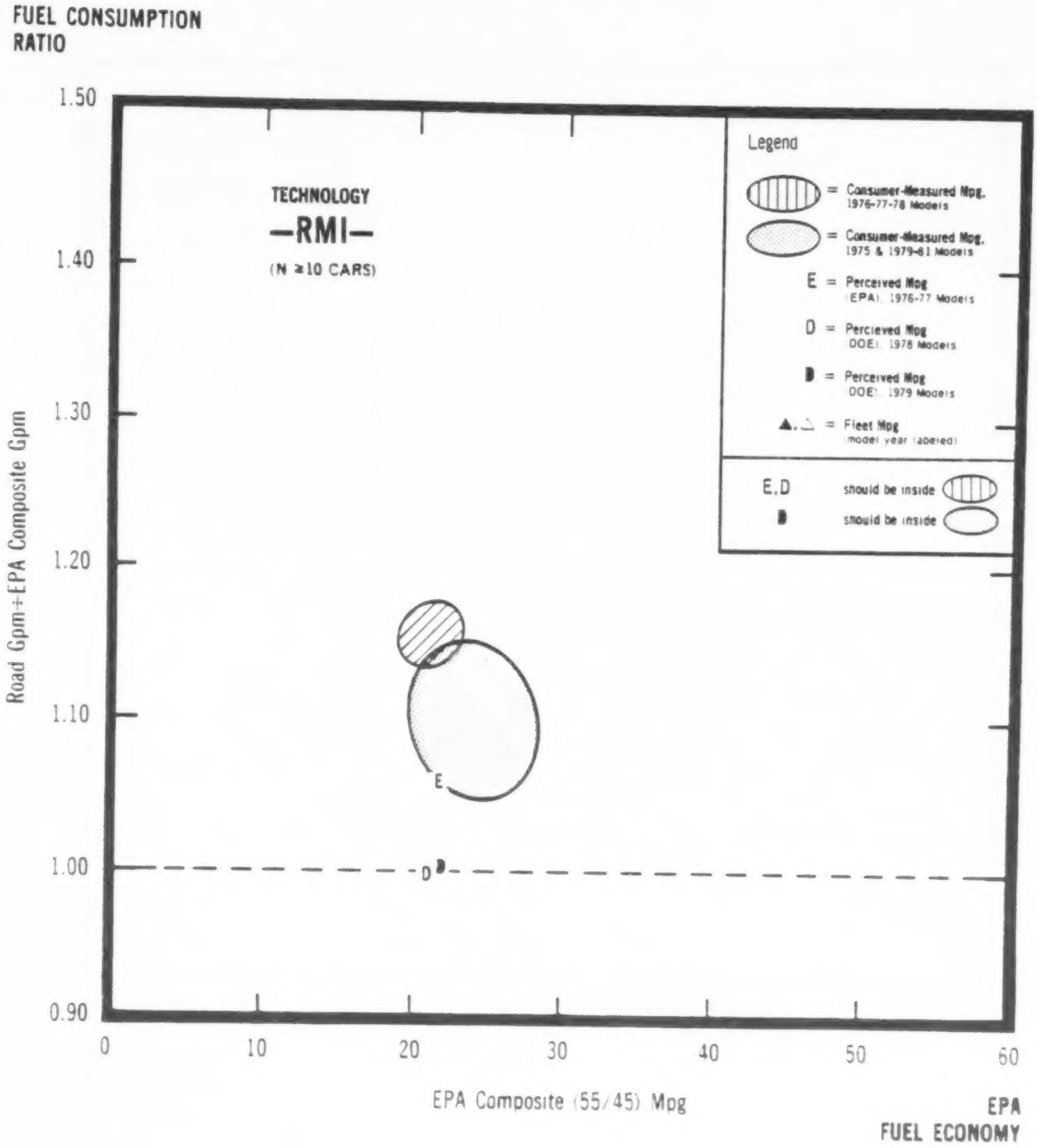


Figure
C—17

Perceived Mpg Data, and Consumer-Measured Mpg Data for RAI Vehicles



Figure

C—18

Perceived Mpg Data, and Consumer-Measured Mpg Data for RMI Vehicles

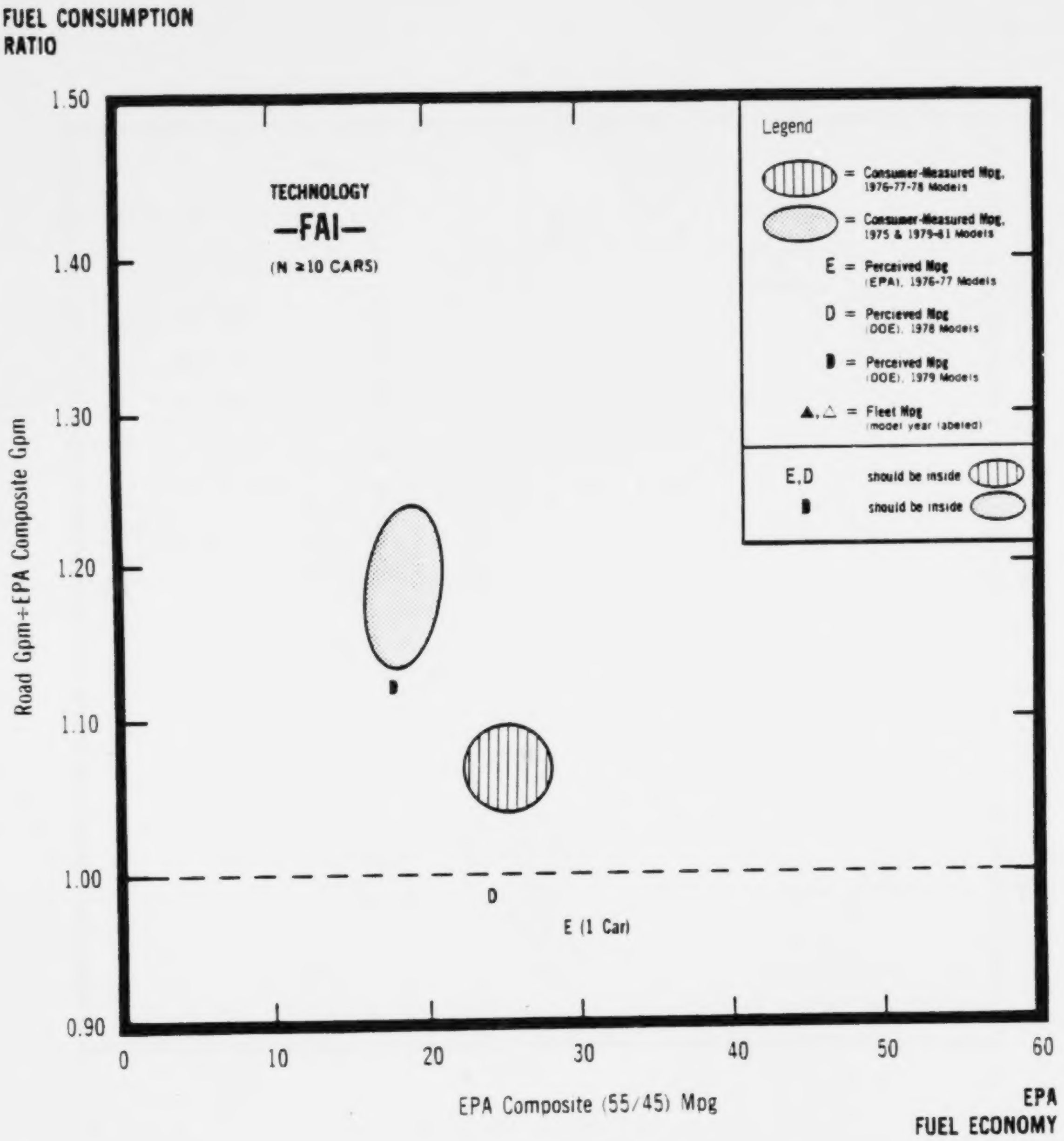
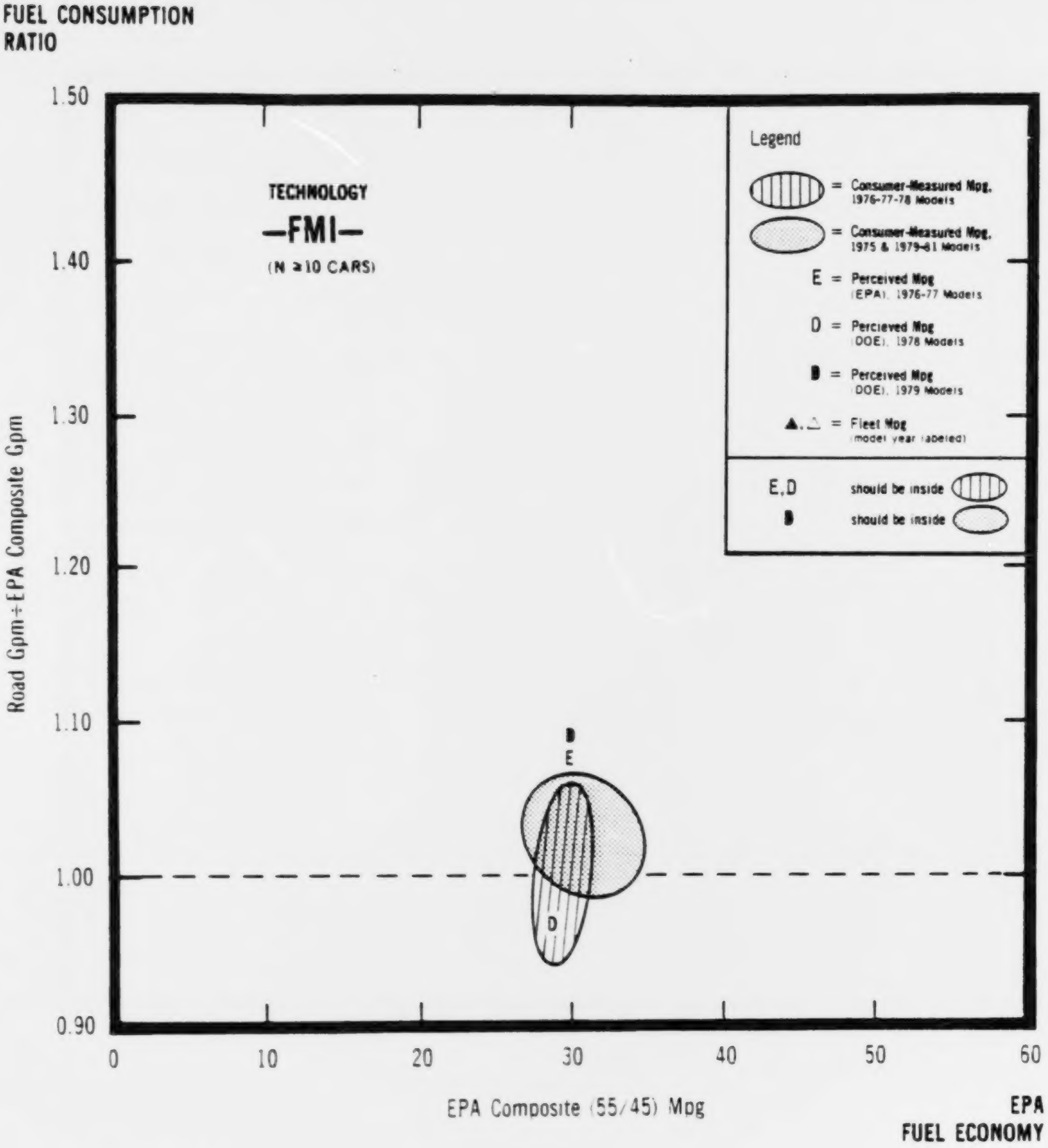


Figure
C—19

PerceivedMpg Data, and Consumer-Measured Mpg Data for FAI Vehicles



Figure

C—20 Perceived Mpg Data, and Consumer-Measured Mpg Data for FMI Vehicles

]

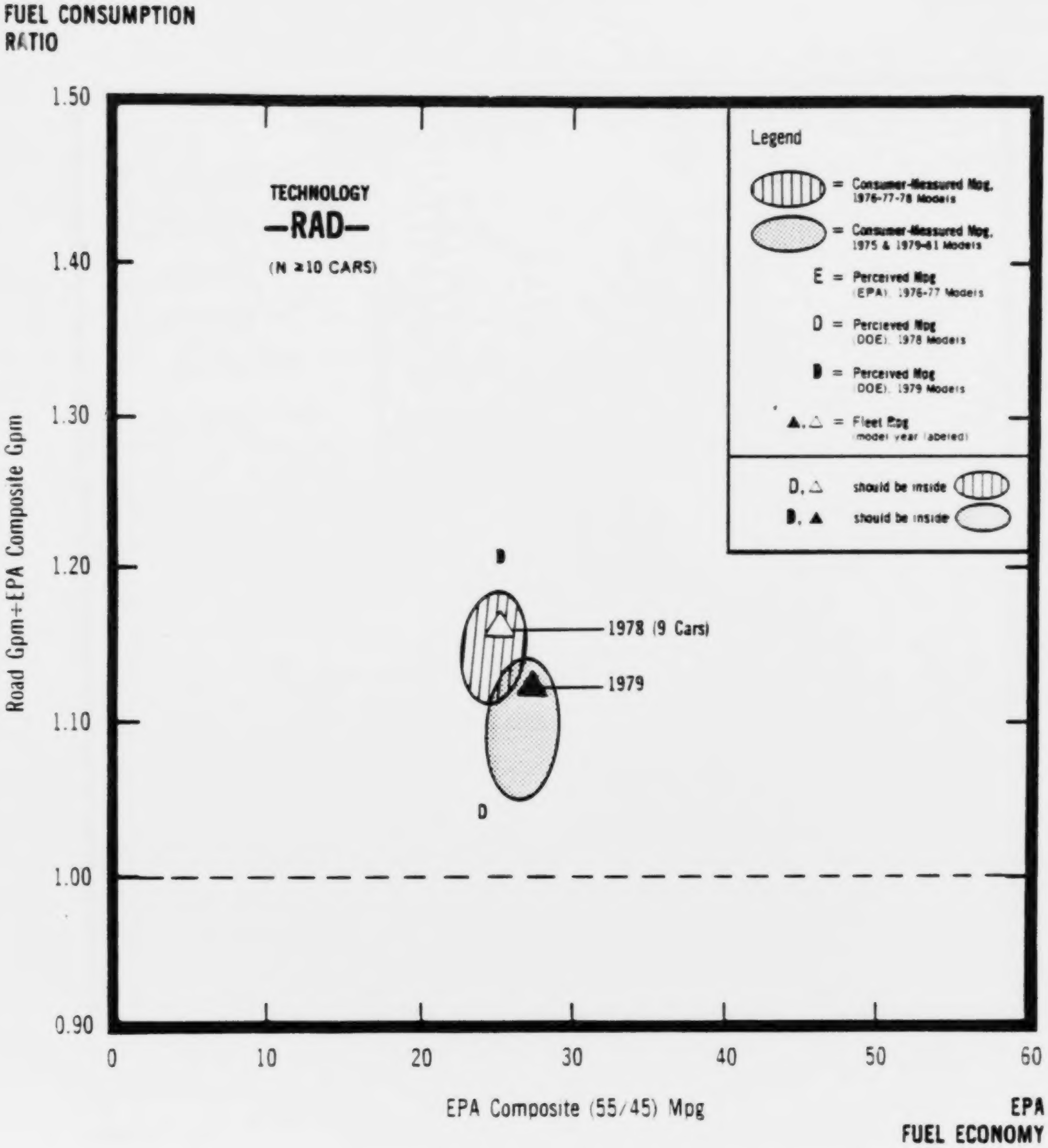


Figure
C–21

Perceived Mpg Data, Fleet Mpg Data, and Consumer-Measured Mpg Data for RAD Vehicles

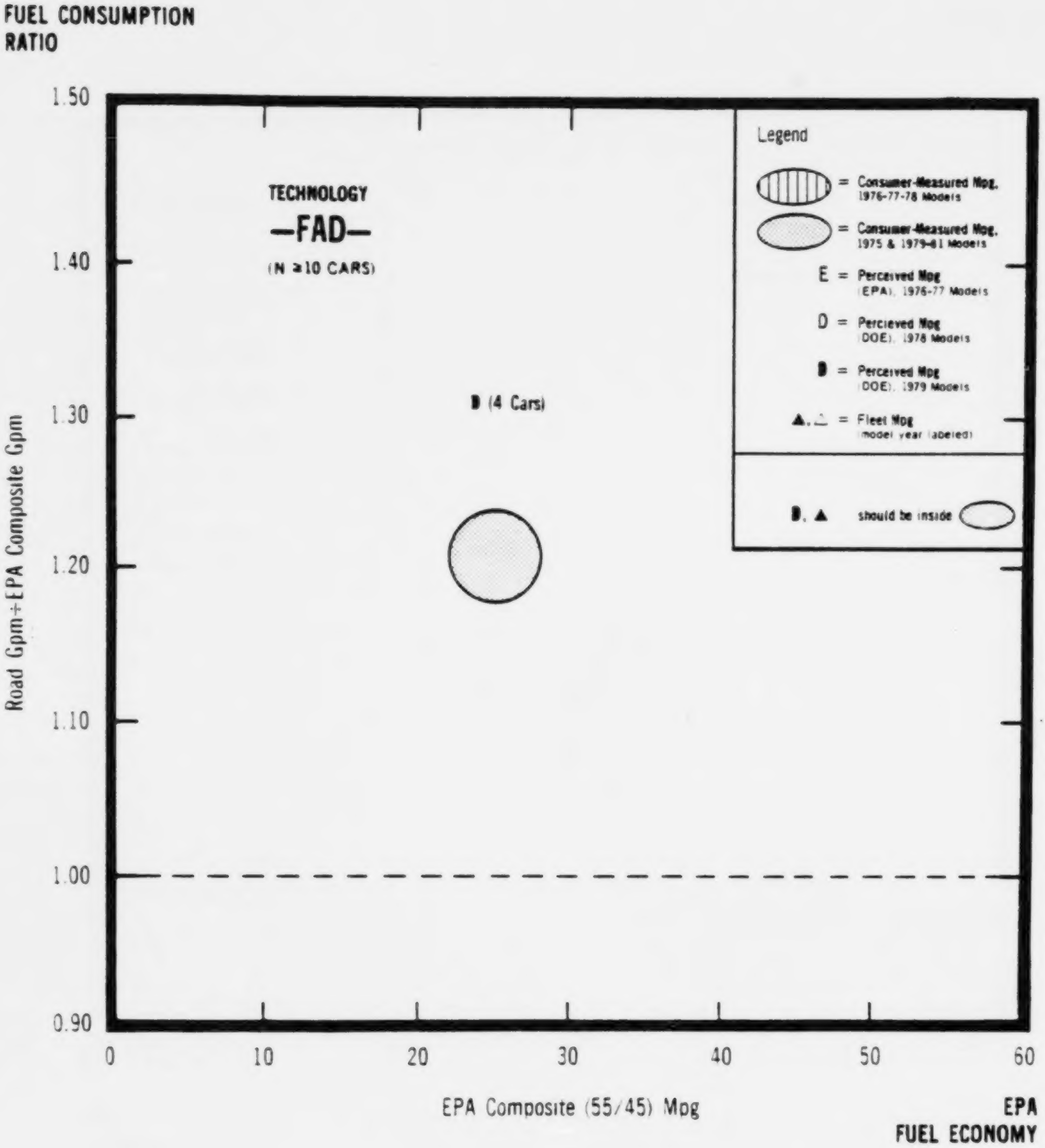


Figure
C—22

Perceived Mpg Data, and Consumer-Measured Mpg Data for FAD Vehicles

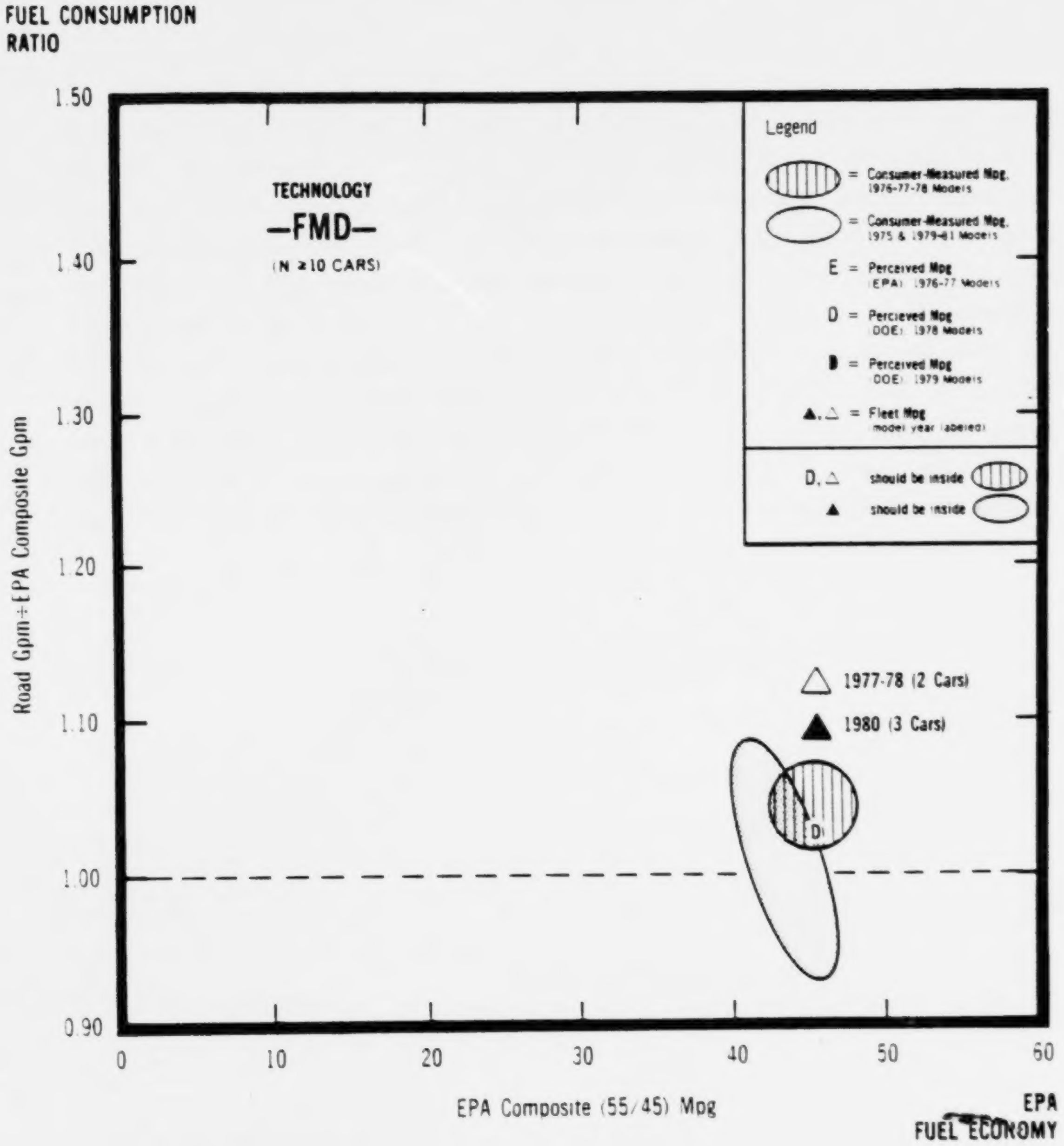


Figure
C—23

Perceived Mpg Data, Fleet Mpg Data, and Consumer-Measured Mpg Data for FMD Vehicles

Fleet Data - figures C-13, C-14, C-21 and C-23 also show fleet data average results, by model year, for those technologies with fleet representation.

Results

Table C-4 summarizes the comparison of perceived MPG data and fleet data against measured data in this general analysis. For carbureted, manual transmission cars (both front and rear drive), all indications are that both perceived and fleet data agree reasonably well with measured consumer MPG data. For rear drive carbureted automatics, perceived data is marginally representative, and fleet data either is or isn't, depending on model year. For front drive manual Diesels, perceived data is acceptable; fleet data is not. For rear drive automatic Diesels, fleet data is acceptable, while perceived data is not. The testimonial to perceived and fleet data ends there. For other technology groups, use of these types of data to draw conclusions about the in-use MPG offset of consumers' cars is likely to lead to serious errors.

Table C-4

Summary Findings on Representativeness* of
Perceived MPG data and Fleet MPG data,
by Vehicle Technology Class

	Perceived Data:		
Technology	Direct Comparison (EF Postcard)	Indirect Comparison	Fleet Data:
RMC	representative	representative	representative (10 cars)
FMC	representative	representative	--
RAC	representative (4% optimistic)	representative? (6% optimistic)	mixed
FAC	optimistic	optimistic	--
RAI, RMI, FAI	(not analyzed separately)	optimistic	--
FMI	(not analyzed separately)	pessimistic	--
FMD	--	representative	pessimistic (5 cars)
RAD	--	not representative	representative
FAD	--	pessimistic	--
RMD	--	--	--

---

*Judged to be "representative" if within 5% of comparable consumer - measured MPG; "optimistic" means perceived or fleet MPG is higher than measured MPG; "pessimistic" means perceived or fleet MPG is lower than measured MPG; "--" means no data.

Conclusions

The only vehicle technologies for which both perceived MPG data and Fleet MPG data are accurate, and therefore usable, are technologies that are well-populated with measured-MPG consumer data already.

Fleet data, but not perceived data, may be acceptable for RAD vehicles,; perceived data, but not fleet data, may be acceptable for FMD vehicles.

If consumer/measured MPG data is assumed to be the accurate measure of what consumer-driven cars are actually doing on the road (and we do assume it to be), it must follow logically that:

1. Other kinds of data are not acceptable for adjustment factor development unless they agree with consumer/measured data;
2. For other kinds of data which do agree with consumer/measured data, merging them with consumer/measured data will not produce conclusions different from the conclusions reached by using consumer/measured data alone;
3. Therefore, nothing can be gained by using perceived or fleet data, even that which agrees with consumer/measured data.

This closes the issue of perceived and fleet data. Only consumer/measured MPG data is appropriate for road MPG adjustment factor development.

APPENDIX D

NON-MODAL AND BI-MODAL GPM RATIO

This page intentionally
blank and un-numbered

APPENDIX D

Proof that Non-modal GPMR Must Have a Value Between Those of Bi-modal GPMRs

Defined: E_c = EPA City MPG ; E_h = EPA Highway MPG

R_c = Road City MPG ; R_h = Road Highway MPG

CGPMR = E_c/R_c = Road city fuel consumption ratio

HGPMR = E_h/R_h = Road highway fuel consumption ratio

E_o = EPA Combined MPG, 55/45 City/Highway

R = Road MPG, non-specific

R_o = a specific road MPG case, 55/45 city/highway

$GPMR_o$ = E_o/R_o = Road 55/45 fuel consumption ratio

True: $$\text{CGPMR} = E_c/R_c \qquad R_c = E_c/\text{CGPMR} \tag{1}$$

$$\text{HGPMR} = E_h/R_h \qquad R_h = E_h/\text{HGPMR} \tag{2}$$

Now, at 55% city driving, the overall road MPG is:

$$R_o = \left[\frac{.55}{R_c} + \frac{.45}{R_h}\right]^{-1}$$

$$= \left[\frac{.55\text{CGPMR}}{E_c} + \frac{.45\text{HGPMR}}{E_h}\right]^{-1} \tag{3}$$

But $E_o = R_o \text{GPMR}_o$, and $E_o = \left[\frac{.55}{E_c} + \frac{.45}{E_h}\right]^{-1}$ (4), (5)

So: $$\left[\frac{.55}{E_c} + \frac{.45}{E_h}\right]^{-1} = \text{GPMR}_o \left[\frac{.55\text{CGPMR}}{E_c} + \frac{.45\text{HGPMR}}{E_h}\right]^{-1} \tag{6}$$

which can be rewritten as:

$$.55 + \frac{.45}{H/C} = \frac{1}{\text{GPMR}_o}\left[.55\text{CGPMR} + \frac{.45\text{HGPMR}}{H/C}\right] \tag{7}$$

wherein H/C is shorthand for the EPA Highway-to-City MPG ratio E_h/E_c.

Now, suppose that $GPMR_o$ is greater than both CGPMR and HGPMR; we may then write $GPMR_o = CGPMR + e_1$ and $GPMR_o = HGPMR + e_2$, where e_1 and e_2 are both positive increments.

Then, $CGPMR = GPMR_o - e_1$ and $HGPMR = GPMR_o - e_2$.

Substituting these in equation (7),

$$.55 + \frac{.45}{H/C} = \frac{1}{GPMR_o}\left[.55(GPMR_o - e_1) + \frac{.45}{H/C}\ (GPMR_o - e_2)\right] \quad (8)$$

$$= .55(N_1<1) + \frac{.45}{H/C}(N_2<1) \quad (9)$$

where $N_1<1$ means "a number less than one" and $N_2<1$ means "another number less than one".

Rearranging,

$$.55\left[1 - (N_1<1)\right] = \frac{.45}{H/C}\left[(N_2<1) - 1\right]$$

or

$$.55\ (N_{pos}) = \frac{.45}{H/C}\ (N_{neg}) \quad (10)$$

where N_{pos} means "a positive number" and N_{neg} means "a negative number".

But this is nonsensical: this solution is impossible because H and C are always positive. Therefore the supposition that $GPMR_o$ can be greater than both CGPMR and HGPMR is an absurd supposition.

Can $GPMR_o$ be less than both CGPMR and HGPMR, then? Working through the same procedure, we are led to:

$$.55\ (N_{neg}) = \frac{.45}{H/C}(N_{pos}) \quad (11)$$

which is an nonsensical as was equation (10). This supposition is therefore also absurd.

Now suppose that GPMR_o is between CGPMR and HGPMR. Consider three possibilities:

(a) $\text{CGPMR} > \text{HGPMR}$, for which $\text{CGPMR} > \text{GPMR}_o > \text{HGPMR}$;

(b) $\text{CGPMR} < \text{HGPMR}$, for which $\text{CGPMR} < \text{GPMR}_o < \text{HGPMR}$; and

(c) $\text{CGPMR} = \text{HGPMR}$, for which $\text{CGPMR} = \text{GPMR}_o = \text{HGPMR}$.

For case (a), let $\text{CGPMR} = \text{GPMR}_o + e_1$ and $\text{HGPMR} = \text{GPMR}_o - e_2$, where both e_1 and e_2 are positive increments.

Then equation (7) leads to:

$$.55 + \frac{.45}{H/C} = .55(N_1 > 1) + \frac{.45}{H/C}(N_2 < 1) \tag{12}$$

which solves as:

$$.55(N_{neg}) = \frac{.45}{H/C}(N_{neg}) \ . \tag{13}$$

Similarly, case (b) leads to:

$$.55(N_{pos}) = \frac{.45}{H/C}(N_{pos}) \ , \tag{14}$$

and case (c) gives:

$$.55 + \frac{.45}{H/C} = .55 + \frac{.45}{H/C} \tag{15}$$

Equations (13), (14), and (15) are all reasonable, and therefore so is the supposition that GPMR_o is between CGPMR and HGPMR.

The reader is encouraged to verify that

$\text{CGPMR} = \text{GPMR}_o > \text{HGPMR}$ leads to $\frac{.45}{H/C} = \frac{.45}{H/C}(N < 1)$,

$\text{CGPMR} > \text{GPMR}_o = \text{HGPMR}$ leads to $.55 = .55(N > 1)$,

$\text{CGPMR} = \text{GPMR}_o < \text{HGPMR}$ leads to $\frac{.45}{H/C} = \frac{.45}{H/C}(N > 1)$, and

$\text{CGPMR} < \text{GPMR}_o = \text{HGPMR}$ leads to $.55 = .55(N < 1)$, all of which are absurd. Thus $GPMR_o$ must be between CGPMR and HGPMR, and can only equal one of them when it equals both of them in the trivial case $GPMR_o = CGPMR = HGPMR$.

Note further that, for any H/C value greater than 0.82, the $GPMR_o$ value will be closer to CGPMR than to HGPMR, i.e., the absolute value of e_1 will be smaller than that of e_2. The general relation between e_1 and e_2, which derives from equation (6), is:

$$.55e_1 = \frac{.45}{H/C} e_2 \tag{16}$$

For a typical H/C of 1.5, $e_1 = .55e_2$, so $GPMR_o$ is about half as far from CGPMR as it is from HGPMR. H/C values less than 1.0 or greater than 2.0 are extremely rare.

APPENDIX E

LISTING OF MODEL TYPE DATA BASE

Record Layout for Appendix E Tables

Variable	Format	Columns	Field Description
1. SORC	F3.0	1-3	Data type 1= Consumer 80= Fleet 90= Perceived
2. MANF	F4.0	4-7	Manufacturer code
3. MDLY	F3.0	8-10	Model year
4. ESTD	A4	11-14	FLDV, etc
5. NAM1	1X,A7	15-22	1st 7 char's of model name
6. NAM2	A7	23-29	Next 7 char's of model name
7. ECID	1X,F4.0	30-34	Engine cu. in. displacement
8. ECYL	F3.0	35-37	No. engine cylinders
9. DVTYP	A1	38	Drive type (Front/Rear)
10. TRTYP	A1	39	Transmission type (Auto/Manu)
11. INTYP	A1	40	Induction type (Carb/FI/Dsl)
12. BOTYP	A1	41	Body type (Sedan/Wagon)
13. NOBS	F6.0	42-47	No. of observations in record
14. EPAC	F5.1	48-52	EPA City MPG
15. EPAH	F5.1	53-57	EPA Hiway MPG
16. EPA	F5.1	58-62	EPA 55/45 MPG
17. CTYF	F5.0	63-67	Percent city driving
18. EOGR	F6.3	68-73	Imputed overall influence index
19. ROAD	F5.1	74-78	Measured overall road MPG
20. AOGR	F6.3	79-84	Actual GPM ratio (EPA/ROAD)
21. IWGT	F6.0	85-90	Inertia weight
22. CLAS	F4.0	91-94	Vehicle size class code

TABLE E-1

LISTING OF MODEL TYPE DATA FOR
CONSUMER DRIVING - MEASURED MPG

```
1. 10.80.CLDV SPIRIT         151. 4.RACS   1. 20.0 25.0 22.0  50. 1.271 20.9 1.049   -0. -0.
1. 10.80.CLDV CONCORD        258. 6.RACS   3. 16.0 24.0 18.8  73. 1.192 16.1 1.173 3500. -0.
1. 10.80.CLDV SPIRIT         258. 6.RACS   1. 18.0 26.0 20.9  75. 1.220 18.7 1.118   -0. -0.
1. 10.80.FLDV CONCORD        151. 4.RACS   3. 20.0 25.0 22.0  54. 1.151 20.4 1.074   -0. -0.
1. 10.80.FLDV SPIRIT         151. 4.RACS   8. 20.0 25.0 22.0  42. 1.170 20.1 1.094   -0. -0.
1. 10.80.FLDV SPIRIT         151. 4.RMCS  15. 22.0 30.0 25.0  41. 1.099 23.1 1.081   -0. -0.
1. 10.78.FLDV CONCORD        258. 6.RACS   1. 16.0 21.0 17.9  50. 1.022 18.4 0.971 3500. -0.
1. 10.79.FLDV CONCORD        258. 6.RACS   2. 17.0 23.0 19.3  25. 0.877 19.7 0.976 3500. -0.
1. 10.80.FLDV CONCORD        258. 6.RACS  32. 18.0 25.0 20.6  44. 1.166 17.9 1.148 3000.  4.
1. 10.75.FLDV PACER          258. 6.RACS   1. 17.0 25.0 19.9  75. 1.100 16.0 1.238 3500. -0.

1. 10.76.FLDV PACER          258. 6.RACS   1. 17.0 22.0 18.9 100. 1.119 13.7 1.382 3500. -0.
1. 10.77.FLDV PACER          258. 6.RACS   2. 17.0 23.0 19.3  55. 1.076 16.3 1.182 3500.  4.
1. 10.80.FLDV SPIRIT         258. 6.RACS  20. 18.0 26.0 20.9  52. 1.186 17.7 1.184   -0. -0.
1. 10.81.FLDV SPIRIT         258. 6.RACS   1. 20.0 26.0 22.3  25. 0.820 20.5 1.088   -0. -0.
1. 10.80.FLDV CONCORD        258. 6.RMCS   4. 17.0 26.0 20.1  75. 1.349 18.8 1.070   -0. -0.
1. 10.77.FLDV GREMLIN        258. 6.RMCS   1. 17.0 26.0 20.1  50. 0.959 15.5 1.303 3000. -0.
1. 10.80.FLDV SPIRIT         258. 6.RMCS   4. 18.0 27.0 21.2  34. 1.179 18.9 1.123   -0. -0.
1. 20.80.CLDV CHAMP           98. 4.FACS   3. 29.0 35.0 31.4  72. 1.201 26.2 1.200   -0. -0.
1. 20.80.CLDV COLT            98. 4.FACS   3. 29.0 35.0 31.4  37. 1.193 27.0 1.162   -0. -0.
1. 20.80.CLDV CHAMP           98. 4.FMCS   9. 31.0 41.0 34.8  51. 1.248 32.7 1.065   -0. -0.

1. 20.80.CLDV COLT            98. 4.FMCS   3. 31.0 41.0 34.8  48. 1.129 30.7 1.134   -0. -0.
1. 20.81.CLDV COLT            98. 4.FMCS   1. 31.0 41.0 34.8  50. 1.047 29.3 1.188   -0. -0.
1. 20.80.CLDV ARROW           98. 4.RACS   2. 27.0 35.0 30.1  21. 0.928 32.1 0.937   -0. -0.
1. 20.80.CLDV ARROW           98. 4.RMCS   2. 27.0 40.0 31.6  53. 1.322 30.2 1.047   -0. -0.
1. 20.79.CLDV HORIZON        105. 4.FACS   1. 21.0 29.0 24.0  50. 0.978 25.3 0.947   -0. -0.
1. 20.80.CLDV HORIZON        105. 4.FACS   6. 23.0 32.0 26.3  58. 1.176 21.2 1.239 2500. -0.
1. 20.79.CLDV OMNI           105. 4.FACS   1. 21.0 29.0 24.0  50. 0.990 26.2 0.914   -0. -0.
1. 20.80.CLDV OMNI           105. 4.FACS   3. 23.0 32.0 26.3  48. 1.396 22.4 1.177   -0. -0.
1. 20.80.CLDV HORIZON        105. 4.FMCS   1. 23.0 37.0 27.7  25. 1.081 28.9 0.958   -0. -0.
1. 20.80.CLDV OMNI           105. 4.FMCS   5. 23.4 37.0 28.0  54. 1.155 24.0 1.169 2500. -0.

1. 20.81.CLDV ARIES          135. 4.FACS   1. 23.0 33.0 26.6  50. 0.938 21.2 1.256   -0. -0.
1. 20.81.CLDV OMNI           135. 4.FACS   1. 23.0 34.0 26.9 100. 1.618 16.6 1.618   -0. -0.
1. 20.81.CLDV ARIES          156. 4.FACS   2. 21.0 28.0 23.7  50. 0.995 25.0 0.944   -0. -0.
1. 20.80.CLDV COLT           156. 4.FMCS   1. 21.0 30.0 24.3  50. 0.976 24.6 0.988   -0. -0.
1. 20.80.CLDV COLT W         156. 4.FMCW   1. 21.0 30.0 24.3   0. 0.956 27.8 0.874   -0. -0.
1. 20.80.CLDV CHALLENGER     156. 4.RACS   2. 20.0 25.0 22.0  30. 1.092 20.8 1.054   -0. -0.
1. 20.80.CLDV SAPPORO        156. 4.RACS   1. 20.0 25.0 22.0  14. 1.111 16.6 1.325   -0. -0.
1. 20.80.CLDV CHALLENGER     156. 4.RMCS  10. 21.0 30.0 24.3  62. 1.237 22.1 1.098   -0. -0.
1. 20.80.CLDV SAPPORO        156. 4.RMCS   3. 21.0 30.0 24.3  65. 0.976 22.1 1.098   -0. -0.
1. 20.80.CLDV ASPEN          225. 6.RACS   1. 16.0 21.0 17.9   0. 1.016 16.7 1.072   -0. -0.

1. 20.81.CLDV CORDOBA        225. 6.RACS   1. 17.0 22.0 18.9  50. 1.107 14.5 1.305   -0. -0.
1. 20.80.CLDV DIPLOMAT       225. 6.RACS   3. 16.0 21.0 17.9  32. 1.184 15.9 1.126   -0. -0.
1. 20.80.CLDV LEBARON        225. 6.RACS   3. 16.0 21.0 17.9  34. 1.128 15.5 1.154   -0. -0.
1. 20.79.CLDV VOLARE         225. 6.RACS   1. 16.0 21.0 17.9  50. 1.145 18.8 0.954 3500. -0.
1. 20.80.CLDV VOLARE         225. 6.RACS   4. 16.0 21.0 17.9  56. 1.143 16.4 1.089 3500. -0.
1. 20.78.CLDV ASPEN          318. 8.RACS   1. 14.0 22.0 16.7  25. 1.028 15.6 1.072   -0. -0.
1. 20.80.CLDV CORDOBA        318. 8.RACS   7. 16.0 24.0 18.8  55. 1.085 15.5 1.214 4000. -0.
1. 20.80.CLDV LEBARON        318. 8.RACS   1. 16.0 24.0 18.8 100. 1.156 18.5 1.019   -0. -0.
1. 20.80.CLDV MIRADA         318. 8.RACS   2. 16.0 24.0 18.8  39. 0.956 17.6 1.072 4000. -0.
1. 20.80.CLDV NEW YORKER     318. 8.RACS   4. 16.0 24.0 18.8  36. 0.982 16.6 1.137   -0. -0.
```

```
1. 20.80.CLDV NEWPORT        318. 8.RACS   2. 16.0 24.0 18.8  62. 1.205 14.1 1.332    -0. -0.
1. 20.80.CLDV ST REGIS       318. 8.RACS   1. 16.0 24.0 18.8  89. 1.233 20.6 0.914    -0. -0.
1. 20.80.CLDV VOLARE         318. 8.RACS   1. 16.0 24.0 18.8   0. 0.749 17.3 1.088    -0. -0.
1. 20.81.CLDV IMPERIAL       318. 8.RAIS   1. 15.0 23.0 17.8  75. 1.339 17.4 1.020    -0. -0.
1. 20.79.FLDV CHAMP           86. 4.FMCS   1. 32.0 44.0 36.5  75. 1.014 31.7 1.152 2250. -0.
1. 20.81.FLDV COLT            86. 4.FMCS   1. 37.0 50.0 41.9 100. 1.265 30.5 1.373    -0. -0.
1. 20.80.FLDV CHAMP           98. 4.FACS  13. 30.0 36.0 32.4  74. 1.278 24.4 1.328    -0. -0.
1. 20.80.FLDV COLT            98. 4.FACS   4. 30.0 36.0 32.4  42. 1.145 24.7 1.314    -0. -0.
1. 20.81.FLDV COLT            98. 4.FACS   1. 28.0 35.0 30.8  50. 0.974 27.4 1.122    -0. -0.
1. 20.80.FLDV CHAMP           98. 4.FMCS  22. 33.0 43.0 36.9  48. 1.123 32.1 1.147    -0. -0.

1. 20.80.FLDV COLT            98. 4.FMCS  20. 33.0 43.0 36.9  52. 1.246 31.6 1.165    -0. -0.
1. 20.81.FLDV COLT            98. 4.FMCS   1. 31.0 41.0 34.8  75. 1.132 32.9 1.057    -0. -0.
1. 20.80.FLDV ARROW           98. 4.RACS   6. 29.0 36.0 31.8  61. 1.235 24.3 1.305    -0. -0.
1. 20.80.FLDV ARROW           98. 4.RMCS  19. 29.0 41.0 33.4  52. 1.132 29.4 1.136    -0. -0.
1. 20.79.FLDV HORIZON        105. 4.FACS   2. 24.0 32.0 27.0  63. 0.989 25.2 1.071 2500. -0.
1. 20.80.FLDV HORIZON        105. 4.FACS  29. 24.0 31.0 26.7  69. 1.283 22.9 1.169    -0. -0.
1. 20.81.FLDV HORIZON        105. 4.FACS  30. 25.0 35.0 28.7  68. 1.170 23.5 1.223    -0. -0.
1. 20.79.FLDV OMNI           105. 4.FACS   4. 24.0 32.0 27.0  72. 1.038 25.7 1.050 2625.  3.
1. 20.80.FLDV OMNI           105. 4.FACS  30. 24.0 31.0 26.7  57. 1.267 23.0 1.160    -0. -0.
1. 20.81.FLDV OMNI           105. 4.FACS  30. 25.0 35.0 28.7  61. 1.143 24.0 1.195    -0. -0.

1. 20.78.FLDV HORIZON        105. 4.FMCS   3. 25.0 38.0 29.5  67. 1.099 28.8 1.026 2500. -0.
1. 20.79.FLDV HORIZON        105. 4.FMCS   2. 25.0 38.0 29.5  63. 1.166 25.6 1.153    -0. -0.
1. 20.80.FLDV HORIZON        105. 4.FMCS  24. 23.0 33.0 26.6  52. 1.202 25.8 1.032 2500. -0.
1. 20.81.FLDV HORIZON        105. 4.FMCS  32. 27.7 42.4 32.8  49. 1.089 29.0 1.131    -0. -0.
1. 20.78.FLDV OMNI           105. 4.FMCS   1. 25.0 38.0 29.5 100. 1.199 23.6 1.253 2500. -0.
1. 20.79.FLDV OMNI           105. 4.FMCS   3. 25.0 34.9 28.6  75. 1.172 27.8 1.037 2500. -0.
1. 20.80.FLDV OMNI           105. 4.FMCS  30. 23.0 33.0 26.6  57. 1.243 27.0 0.986    -0. -0.
1. 20.81.FLDV OMNI           105. 4.FMCS  32. 27.6 42.4 32.8  57. 1.116 28.6 1.146    -0. -0.
1. 20.81.FLDV ARIES          135. 4.FACS  16. 24.0 35.0 27.9  56. 1.140 23.7 1.179    -0. -0.
1. 20.81.FLDV HORIZON        135. 4.FACS  30. 24.0 35.0 27.9  65. 1.157 22.7 1.232    -0. -0.

1. 20.81.FLDV OMNI           135. 4.FACS  31. 24.0 35.0 27.9  61. 1.144 22.4 1.251    -0. -0.
1. 20.81.FLDV RELIANT        135. 4.FACS   7. 24.0 35.0 27.9  52. 1.098 24.9 1.121    -0. -0.
1. 20.81.FLDV ARIES W        135. 4.FACW   1. 23.0 34.0 26.9  50. 1.089 15.8 1.704    -0. -0.
1. 20.81.FLDV RELIANT W      135. 4.FACW   3. 23.0 34.0 26.9  63. 1.199 23.8 1.129    -0. -0.
1. 20.81.FLDV ARIES          135. 4.FMCS   8. 25.0 41.0 30.3  53. 1.077 26.9 1.128    -0. -0.
1. 20.81.FLDV HORIZON        135. 4.FMCS  31. 25.0 41.0 30.3  55. 1.115 27.6 1.099    -0. -0.
1. 20.81.FLDV OMNI           135. 4.FMCS  30. 25.0 41.0 30.3  49. 1.088 27.0 1.125    -0. -0.
1. 20.81.FLDV RELIANT        135. 4.FMCS   5. 25.0 41.0 30.3  43. 1.052 25.8 1.177    -0. -0.
1. 20.81.FLDV ARIES W        135. 4.FMCW   2. 24.0 40.0 29.3  55. 1.108 27.4 1.068    -0. -0.
1. 20.81.FLDV RELIANT W      135. 4.FMCW   1. 24.0 40.0 29.3  60. 1.105 27.5 1.064    -0. -0.

1. 20.81.FLDV ARIES          156. 4.FACS  31. 23.0 31.0 26.0  52. 1.173 24.4 1.068    -0. -0.
1. 20.80.FLDV COLT           156. 4.FACS   1. 22.0 26.0 23.6  25. 1.014 23.3 1.013    -0. -0.
1. 20.81.FLDV RELIANT        156. 4.FACS  32. 23.0 31.0 26.0  64. 1.231 23.9 1.086    -0. -0.
1. 20.81.FLDV ARIES W        156. 4.FACW  30. 23.0 31.0 26.0  66. 1.228 23.8 1.095    -0. -0.
1. 20.80.FLDV COLT W         156. 4.FACW   2. 22.0 26.0 23.6  63. 1.179 21.2 1.116    -0. -0.
1. 20.81.FLDV RELIANT W      156. 4.FACW  30. 23.0 31.0 26.0  63. 1.222 23.7 1.097    -0. -0.
1. 20.80.FLDV COLT W         156. 4.FMCW   6. 21.0 32.0 24.8  47. 1.208 22.7 1.093    -0. -0.
1. 20.80.FLDV CHALLENGER     156. 4.RACS   9. 22.0 26.0 23.6  55. 1.145 20.3 1.164    -0. -0.
1. 20.80.FLDV SAPPORO        156. 4.RACS  21. 22.0 26.0 23.6  60. 1.175 20.1 1.176    -0. -0.
1. 20.81.FLDV SAPPORO        156. 4.RACS   1. 21.0 26.0 23.0 100. 1.242 21.0 1.095    -0. -0.

1. 20.80.FLDV ARROW          156. 4.RMCS   2. 22.0 34.0 26.1 100. 1.197 22.9 1.143    -0. -0.
1. 20.80.FLDV CHALLENGER     156. 4.RMCS  24. 21.0 32.0 24.8  45. 1.125 23.3 1.067    -0. -0.
1. 20.80.FLDV SAPPORO        156. 4.RMCS  25. 21.0 32.0 24.8  55. 1.185 22.0 1.127    -0. -0.
1. 20.81.FLDV SAPPORO        156. 4.RMCS   1. 20.0 30.0 23.5  50. 1.138 25.0 0.941    -0. -0.
1. 20.78.FLDV ASPEN          225. 6.RACS   3. 18.6 25.6 21.2  68. 1.065 15.8 1.339 3500.  4.
1. 20.79.FLDV ASPEN          225. 6.RACS   1. 18.0 24.0 20.3  50. 1.193 17.1 1.187 3500. -0.
1. 20.80.FLDV ASPEN          225. 6.RACS  32. 17.0 24.9 19.9  53. 1.224 16.5 1.202    -0. -0.
1. 20.80.FLDV CORDOBA        225. 6.RACS  16. 17.0 25.0 19.9  60. 1.217 17.9 1.107    -0. -0.
1. 20.81.FLDV CORDOBA        225. 6.RACS  30. 18.0 23.0 19.9  64. 1.147 17.0 1.172    -0. -0.
1. 20.75.FLDV DART           225. 6.RACS   2. 17.0 23.0 19.3  63. 0.969 16.5 1.168 3500. -0.
```

```
1. 20.80.FLDV DIPLOMAT        225. 6.RACS  25. 17.0 25.0 19.9  55. 1.235 16.5 1.203   -0. -0.
1. 20.81.FLDV DIPLOMAT        225. 6.RACS  20. 18.0 23.0 19.9  77. 1.206 15.3 1.305   -0. -0.
1. 20.80.FLDV GRAN FURY       225. 6.RACS  12. 16.0 23.0 18.5  41. 1.194 16.5 1.125   -0. -0.
1. 20.81.FLDV GRAN FURY       225. 6.RACS   2. 17.0 22.0 18.9  73. 1.131 17.2 1.098   -0. -0.
1. 20.80.FLDV LEBARON         225. 6.RACS  30. 17.0 25.0 19.9  46. 1.216 16.9 1.177   -0. -0.
1. 20.81.FLDV LEBARON         225. 6.RACS  30. 18.0 23.0 19.9  69. 1.172 15.8 1.262   -0. -0.
1. 20.80.FLDV MIRADA          225. 6.RACS  20. 17.0 25.0 19.9  60. 1.212 17.5 1.135   -0. -0.
1. 20.81.FLDV MIRADA          225. 6.RACS  30. 18.0 23.0 19.9  61. 1.150 16.8 1.185   -0. -0.
1. 20.80.FLDV NEWPORT         225. 6.RACS  13. 16.0 23.0 18.5  54. 1.261 16.8 1.101   -0. -0.
1. 20.81.FLDV NEWPORT         225. 6.RACS   3. 17.0 22.0 18.9  93. 1.229 14.9 1.268   -0. -0.

1. 20.80.FLDV ST REGIS        225. 6.RACS  10. 16.0 23.0 18.5  67. 1.291 14.2 1.309   -0. -0.
1. 20.81.FLDV ST REGIS        225. 6.RACS   2. 17.0 22.0 18.9  58. 1.157 14.9 1.268   -0. -0.
1. 20.76.FLDV VALIANT         225. 6.RACS   1. 18.0 24.0 20.3  55. 1.173 17.7 1.148 3500. -0.
1. 20.76.FLDV VOLARE          225. 6.RACS   1. 18.0 23.0 19.9  75. 0.969 17.0 1.174 3500. -0.
1. 20.77.FLDV VOLARE          225. 6.RACS   4. 16.0 21.0 17.9  55. 1.063 15.8 1.132 3500.  4.
1. 20.78.FLDV VOLARE          225. 6.RACS   5. 19.6 26.6 22.2  55. 1.074 18.0 1.230 3500.  4.
1. 20.79.FLDV VOLARE          225. 6.RACS   3. 18.0 24.7 20.5  62. 1.082 18.0 1.137 3500.  5.
1. 20.80.FLDV VOLARE          225. 6.RACS  31. 17.0 24.9 19.9  50. 1.219 16.5 1.204   -0. -0.
1. 20.80.FLDV ASPEN           225. 6.RACW   9. 16.0 23.0 18.5  54. 1.187 17.8 1.038   -0. -0.
1. 20.80.FLDV DIPLOMAT W      225. 6.RACW   7. 16.0 23.0 18.5  35. 1.144 16.8 1.104   -0. -0.

1. 20.81.FLDV DIPLOMAT W      225. 6.RACW  17. 17.0 22.0 18.9  66. 1.161 15.8 1.196   -0. -0.
1. 20.80.FLDV LEBARON W       225. 6.RACW   2. 16.0 23.0 18.5 100. 1.205 20.4 0.908   -0. -0.
1. 20.81.FLDV LEBARON W       225. 6.RACW  12. 17.0 22.0 18.9  62. 1.169 14.5 1.306   -0. -0.
1. 20.80.FLDV VOLARE W        225. 6.RACW  16. 16.0 23.0 18.5  46. 1.175 16.3 1.139   -0. -0.
1. 20.80.FLDV ASPEN           225. 6.RMCS   2. 17.0 24.8 19.8  78. 1.353 17.9 1.104   -0. -0.
1. 20.78.FLDV LEBARON         225. 6.RMCS   2. 17.0 25.0 19.9  55. 1.068 17.1 1.164 4500.  5.
1. 20.80.FLDV VOLARE          225. 6.RMCS   3. 17.0 24.2 19.7  13. 1.158 18.9 1.040   -0. -0.
1. 20.80.FLDV VOLARE W        225. 6.RMCW   2. 16.0 22.4 18.3  90. 1.294 16.9 1.084   -0. -0.
1. 20.78.FLDV ASPEN           318. 8.RACS   1. 15.0 22.0 17.5  50. 1.206 13.7 1.281   -0. -0.
1. 20.79.FLDV ASPEN           318. 8.RACS   1. 16.0 23.0 18.5  25. 1.097 14.8 1.254 4000. -0.

1. 20.80.FLDV ASPEN           318. 8.RACS   1. 15.0 23.0 17.8  53. 1.286 18.4 0.965   -0. -0.
1. 20.77.FLDV CORDOBA         318. 8.RACS   2. 13.0 18.0 14.9  55. 1.017 13.6 1.093 4000.  5.
1. 20.79.FLDV CORDOBA         318. 8.RACS   1. 16.0 23.0 18.5 100. 1.177 12.9 1.442 4500. -0.
1. 20.80.FLDV CORDOBA         318. 8.RACS  16. 15.0 23.0 17.8  50. 1.128 16.3 1.095 4000. -0.
1. 20.81.FLDV CORDOBA         318. 8.RACS  32. 17.0 26.0 20.1  65. 1.172 17.6 1.144   -0. -0.
1. 20.75.FLDV CORONET         318. 8.RACS   1. 13.0 17.0 14.5   0. 0.675 17.8 0.818 4000. -0.
1. 20.76.FLDV CORONET         318. 8.RACS   1. 13.0 18.0 14.9  75. 1.145 12.4 1.194 4500. -0.
1. 20.78.FLDV DIPLOMAT        318. 8.RACS   1. 15.0 22.0 17.5  55. 1.060 17.6 0.995 4000.  5.
1. 20.79.FLDV DIPLOMAT        318. 8.RACS   1. 16.0 23.0 18.5  75. 1.063 14.5 1.276 4000. -0.
1. 20.80.FLDV DIPLOMAT        318. 8.RACS   6. 15.0 23.0 17.8  44. 1.150 15.7 1.128   -0. -0.

1. 20.81.FLDV DIPLOMAT        318. 8.RACS   5. 17.0 26.0 20.1  50. 1.129 16.3 1.239   -0. -0.
1. 20.75.FLDV FURY            318. 8.RACS   2. 11.9 16.5 13.6 100. 1.422 12.7 1.081 4000. -0.
1. 20.77.FLDV FURY            318. 8.RACS   5. 13.0 18.0 14.9  68. 1.143 11.2 1.319 4200.  5.
1. 20.80.FLDV GRAN FURY       318. 8.RACS  23. 15.0 23.0 17.8  45. 1.233 14.2 1.254   -0. -0.
1. 20.81.FLDV GRAN FURY       318. 8.RACS   4. 17.0 26.0 20.1  59. 1.161 16.4 1.228   -0. -0.
1. 20.78.FLDV LEBARON         318. 8.RACS   2. 15.0 22.0 17.5  78. 1.147 14.1 1.244 4500.  5.
1. 20.80.FLDV LEBARON         318. 8.RACS  15. 15.0 22.9 17.8  42. 1.151 15.5 1.149 4000. -0.
1. 20.81.FLDV LEBARON         318. 8.RACS  29. 17.0 26.0 20.1  59. 1.149 17.2 1.172   -0. -0.
1. 20.80.FLDV MIRADA          318. 8.RACS  16. 15.0 23.0 17.8  44. 1.140 16.7 1.063   -0. -0.
1. 20.81.FLDV MIRADA          318. 8.RACS  30. 17.0 26.0 20.1  61. 1.152 17.4 1.159   -0. -0.

1. 20.77.FLDV MONACO          318. 8.RACS   1. 13.0 18.0 14.9  55. 1.083 12.5 1.189 4000.  5.
1. 20.80.FLDV NEW YORKER      318. 8.RACS  16. 15.0 23.0 17.8  65. 1.243 14.2 1.248   -0. -0.
1. 20.79.FLDV NEWPORT         318. 8.RACS   1. 16.0 23.0 18.5  55. 1.075 11.2 1.655 4312.  6.
1. 20.80.FLDV NEWPORT         318. 8.RACS  26. 15.0 23.0 17.8  45. 1.122 15.4 1.158   -0. -0.
1. 20.81.FLDV NEWPORT         318. 8.RACS  30. 16.8 25.4 19.8  67. 1.165 16.2 1.229   -0. -0.
1. 20.79.FLDV ST REGIS        318. 8.RACS   2. 16.0 23.0 18.5  55. 1.075 17.1 1.084 4000.  6.
1. 20.80.FLDV ST REGIS        318. 8.RACS  29. 15.0 23.0 17.8  41. 1.098 14.7 1.212   -0. -0.
1. 20.81.FLDV ST REGIS        318. 8.RACS  30. 16.8 25.4 19.8  61. 1.156 15.9 1.249   -0. -0.
1. 20.78.FLDV VOLARE          318. 8.RACS   1. 15.0 22.0 17.5  55. 1.074 14.7 1.191 4000.  4.
1. 20.80.FLDV ASPEN           318. 8.RACW   1. 15.0 23.0 17.8   4. 0.907 15.2 1.171   -0. -0.
```

```
1. 20.77.FLDV ASPEN W        318. 8.RACW   1. 15.0 20.0 16.9  55. 1.018 16.1 1.050 4000.  8.
1. 20.80.FLDV DIPLOMAT W     318. 8.RACW   2. 15.0 23.0 17.8  72. 1.344 15.9 1.118   -0. -0.
1. 20.81.FLDV DIPLOMAT W     318. 8.RACW  30. 17.0 26.0 20.1  61. 1.171 17.0 1.185   -0. -0.
1. 20.80.FLDV LEBARON W      318. 8.RACW   2. 15.0 23.0 17.8  52. 1.160 13.8 1.281   -0. -0.
1. 20.81.FLDV LEBARON W      318. 8.RACW  21. 17.0 26.0 20.1  65. 1.172 16.7 1.209   -0. -0.
1. 20.77.FLDV VOLARE         318. 8.RACW   1. 15.0 20.0 16.9  55. 1.076 15.6 1.083 4000.  8.
1. 20.80.FLDV VOLARE W       318. 8.RACW   1. 15.0 23.0 17.8   0. 0.814 17.3 1.026   -0. -0.
1. 20.81.FLDV IMPERIAL       318. 8.RAIS   6. 16.0 26.0 19.3  70. 1.178 18.4 1.053   -0. -0.
1. 20.79.FLDV CORDOBA        360. 8.RACS   1. 14.0 22.0 16.7  50. 1.061 14.2 1.182 4500. -0.
1. 20.78.FLDV LEBARON        360. 8.RACS   1. 14.0 22.0 16.7  55. 1.073 14.5 1.154 5000.  5.

1. 20.75.FLDV MONACO         360. 8.RACS   1. 11.0 18.0 13.3  50. 1.025 12.8 1.038 4500. -0.
1. 20.79.FLDV NEW YORKER     360. 8.RACS   1. 14.0 22.0 16.7  75. 1.138 16.9 0.989 4500. -0.
1. 20.80.FLDV NEW YORKER     360. 8.RACS  14. 14.0 21.0 16.5  48. 1.228 14.3 1.148   -0. -0.
1. 20.80.FLDV NEWPORT        360. 8.RACS   1. 14.0 21.0 16.5   0. 0.908 16.0 1.030   -0. -0.
1. 20.76.FLDV CORDOBA        400. 8.RACS   1. 10.0 16.0 12.0  50. 0.991 11.5 1.047 4500. -0.
1. 20.78.FLDV NEW YORKER     400. 8.RACS   1. 11.0 18.0 13.3 100. 1.360  8.6 1.552 5000..-0.
1. 20.77.FLDV NEWPORT        400. 8.RACS   1. 11.0 18.0 13.3  50. 0.897 13.5 0.984 5000. -0.
1. 20.78.FLDV NEWPORT        400. 8.RACS   2. 11.0 18.0 13.3  55. 1.072 12.1 1.102 5000.  6.
1. 30.80.CLDV FIESTA          98. 4.FMCS  34. 25.1 35.7 29.1  54. 1.257 25.9 1.127   -0. -0.
1. 30.80.CLDV BOBCAT         140. 4.RACS   8. 21.1 31.6 24.8  74. 1.377 18.8 1.319   -0. -0.

1. 30.80.CLDV CAPRI          140. 4.RACS   5. 21.0 31.5 24.7  60. 1.276 18.2 1.360   -0. -0.
1. 30.80.CLDV FAIRMONT       140. 4.RACS   4. 21.0 31.3 24.6  68. 1.594 16.1 1.531   -0. -0.
1. 30.80.CLDV MUSTANG        140. 4.RACS  17. 21.0 31.5 24.7  56. 1.422 18.2 1.355   -0. -0.
1. 30.78.CLDV PINTO          140. 4.RACS   1. 21.0 29.0 24.0  75. 1.118 21.4 1.120   -0. -0.
1. 30.80.CLDV PINTO          140. 4.RACS  24  21.2 28.1 23.8  58. 1.429 18.2 1.316   -0. -0.
1. 30.80.CLDV ZEPHYR         140. 4.RACS   3. 20.9 31.2 24.6  54. 1.395 18.3 1.344   -0. -0.
1. 30.80.CLDV BOBCAT W       140. 4.RACW  11. 21.1 31.5 24.8  62. 1.549 17.7 1.404   -0. -0.
1. 30.80.CLDV PINTO W        140. 4.RACW   9. 21.1 31.5 24.8  49. 1.279 19.1 1.296   -0. -0.
1. 30.80.CLDV BOBCAT         140. 4.RMCS  10. 20.9 30.6 24.4  47. 1.248 22.3 1.099   -0. -0.
1. 30.80.CLDV CAPRI          140. 4.RMCS  30. 19.9 30.6 23.6  51. 1.303 18.1 1.305   -0. -0.

1. 30.80.CLDV FAIRMONT       140. 4.RMCS   5. 20.9 31.2 24.6  69. 1.445 21.1 1.164   -0. -0.
1. 30.80.CLDV MUSTANG        140. 4.RMCS  34  20.3 30.6 23.9  57. 1.330 18.9 1.268   -0. -0.
1. 30.81.CLDV MUSTANG        140. 4.RMCS   1. 23.0 33.0 26.6  25. 0.864 38.4 0.693   -0. -0.
1. 30.80.CLDV PINTO          140. 4.RMCS  32. 20.9 30.6 24.4  59. 1.356 21.0 1.158   -0. -0.
1. 30.80.CLDV ZEPHYR         140. 4.RMCS  10. 20.9 31.3 24.6  50. 1.187 22.3 1.102   -0. -0.
1. 30.80.CLDV BOBCAT W       140. 4.RMCW   1. 20.9 31.3 24.6  49. 0.948 25.1 0.981   -0. -0.
1. 30.80.CLDV FAIRMONT W     140. 4.RMCW   2. 20.9 31.3 24.6  42. 1.179 24.5 1.003   -0. -0.
1. 30.80.CLDV PINTO W        140. 4.RMCW  21. 20.9 31.3 24.6  51. 1.280 20.7 1.194   -0. -0.
1. 30.80.CLDV ZEPHYR W       140. 4.RMCW   4. 20.9 31.3 24.6  38. 1.162 21.6 1.138   -0. -0.
1. 30.78.CLDV MUSTANG        171. 6.RACS   1. 16.0 23.0 18.5  75. 1.162 15.5 1.196   -0. -0.

1. 30.79.CLDV MUSTANG        171. 6.RACS   1. 16.0 22.0 18.2  75. 1.207 16.0 1.136   -0. -0.
1. 30.80.CLDV CAPRI          200. 6.RACS  31. 18.1 25.4 20.8  62. 1.315 18.1 1.150   -0. -0.
1. 30.80.CLDV FAIRMONT       200. 6.RACS  28. 18.1 25.3 20.8  69. 1.319 17.5 1.189 3000. -0.
1. 30.81.CLDV FAIRMONT       200. 6.RACS   1. 20.0 28.0 22.9  75. 1.151 15.0 1.528   -0. -0.
1. 30.81.CLDV GRANADA        200. 6.RACS   1. 19.0 25.0 21.3  25. 0.878 18.5 1.149   -0. -0.
1. 30.80.CLDV MUSTANG        200. 6.RACS  36. 18.1 25.3 20.8  62. 1.316 17.6 1.180 3000. -0.
1. 30.81.CLDV MUSTANG        200. 6.RACS   1. 20.0 28.0 22.9  50. 0.944 17.7 1.294   -0. -0.
1. 30.78.CLDV ZEPHYR         200. 6.RACS   1. 18.0 23.0 19.9  50. 1.072 14.2 1.402   -0. -0.
1. 30.80.CLDV ZEPHYR         200. 6.RACS  32. 18.1 25.4 20.8  57. 1.395 17.4 1.199   -0. -0.
1. 30.81.CLDV ZEPHYR         200. 6.RACS   2. 18.9 25.8 21.5  75. 1.115 14.9 1.443   -0. -0.

1. 30.80.CLDV FAIRMONT W     200. 6.RACW  31. 18.1 25.4 20.8  56. 1.305 17.6 1.185   -0. -0.
1. 30.80.CLDV ZEPHYR W       200. 6.RACW  30. 18.1 25.4 20.8  58. 1.408 17.4 1.193   -0. -0.
1. 30.81.CLDV MUSTANG        200. 6.RMCS   1. 20.0 30.0 23.5  75. 1.173 16.1 1.464   -0. -0.
1. 30.79.CLDV MONARCH        250. 6.RACS   1. 16.0 21.0 17.9 100. 1.359 10.8 1.667   -0. -0.
1. 30.80.CLDV CAPRI          255. 8.RACS  10. 17.2 23.0 19.4  39. 1.194 17.8 1.091   -0. -0.
1. 30.80.CLDV COUGAR         255. 8.RACS  12. 18.0 24.3 20.4  62. 1.404 15.5 1.309   -0. -0.
1. 30.80.CLDV FAIRMONT       255. 8.RACS  10. 18.2 24.4 20.6  63. 1.320 16.3 1.263   -0. -0.
1. 30.81.CLDV FAIRMONT       255. 8.RACS   1. 18.0 25.0 20.6  50. 0.899 20.9 0.985   -0. -0.
1. 30.80.CLDV MUSTANG        255. 8.RACS  17. 18.3 25.3 20.9  56. 1.289 17.0 1.225   -0. -0.
1. 30.80.CLDV THUNDERBIRD    255. 8.RACS  27  18.0 24.3 20.4  57  1.328 16.0 1.275   -0. -0.
```

```
1.  30.81.CLDV THUNDERBIRD    255.  8.RACS    1.  18.0 25.0 20.6   25.  0.952 20.5 1.002    -0.  -0.
1.  30.80.CLDV ZEPHYR         255.  8.RACS   26.  18.1 24.4 20.5   58.  1.357 17.5 1.173    -0.  -0.
1.  30.80.CLDV FAIRMONT W     255.  8.RACW   29.  18.0 24.3 20.4   65.  1.315 15.8 1.295    -0.  -0.
1.  30.80.CLDV ZEPHYR W       255.  8.RACW   30.  18.0 24.3 20.4   61.  1.377 15.7 1.302    -0.  -0.
1.  30.80.CLDV COUGAR         302.  8.RACS   29.  16.7 26.3 20.0   43.  1.134 16.4 1.222    -0.  -0.
1.  30.78.CLDV FAIRMONT       302.  8.RACS    1.  16.0 21.0 17.9   75.  1.244 12.0 1.487    -0.  -0.
1.  30.79.CLDV FAIRMONT       302.  8.RACS    1.  15.0 20.0 16.9   75.  1.499 14.4 1.174    -0.  -0.
1.  30.78.CLDV GRANADA        302.  8.RACS    1.  15.0 23.0 17.8  100.  1.423 12.5 1.424    -0.  -0.
1.  30.80.CLDV GRANADA        302.  8.RACS   18.  16.3 23.2 18.8   64.  1.318 13.9 1.347    -0.  -0.
1.  30.80.CLDV LTD            302.  8.RACS   23.  14.7 20.8 16.9   56.  1.298 13.3 1.267    -0.  -0.

1.  30.80.CLDV MARQUIS        302.  8.RACS   25.  14.7 20.8 16.9   64.  1.328 14.0 1.206    -0.  -0.
1.  30.80.CLDV MONARCH        302.  8.RACS   13.  15.7 21.9 18.0   55.  1.409 14.2 1.262    -0.  -0.
1.  30.80.CLDV THUNDERBIRD    302.  8.RACS   31.  16.7 26.1 20.0   53.  1.274 15.8 1.258    -0.  -0.
1.  30.81.CLDV THUNDERBIRD    302.  8.RACS    1.  17.0 25.0 19.9   50.  0.995 17.0 1.170    -0.  -0.
1.  30.80.CLDV VERSAILLES     302.  8.RACS    8.  14.9 20.2 16.9   58.  1.256 13.2 1.281    -0.  -0.
1.  30.80.CLDV LTD W          302.  8.RACW    4.  14.7 20.8 16.9   63.  1.372 13.8 1.229    -0.  -0.
1.  30.80.CLDV MARQUIS W      302.  8.RACW    2.  14.7 20.8 16.9   24.  1.112 14.8 1.141    -0.  -0.
1.  30.80.CLDV CONTINENTAL    302.  8.RAIS   12.  15.7 23.9 18.6   64.  1.305 15.6 1.196    -0.  -0.
1.  30.80.CLDV MARK           302.  8.RAIS   12.  15.7 23.9 18.6   53.  1.254 15.4 1.207    -0.  -0.
1.  30.80.CLDV CONTINENTAL    351.  8.RACS   24.  14.8 23.7 17.8   58.  1.205 15.4 1.154  4500.  -0.

1.  30.80.CLDV LTD            351.  8.RACS   29.  16.0 26.0 19.3   65.  1.326 14.5 1.331  4000.  -0.
1.  30.80.CLDV MARK           351.  8.RACS   15.  14.8 23.7 17.8   77.  1.371 12.9 1.380  4500.  -0.
1.  30.80.CLDV MARQUIS        351.  8.RACS   33.  16.0 26.0 19.3   57.  1.274 15.4 1.251    -0.  -0.
1.  30.81.CLDV MARQUIS        351.  8.RACS    1.  15.0 24.0 18.0   50.  1.077 13.9 1.300    -0.  -0.
1.  30.79.CLDV THUNDERBIRD    351.  8.RACS    1.  11.0 17.0 13.1   50.  1.119 10.4 1.256    -0.  -0.
1.  30.80.CLDV LTD W          351.  8.RACW   14.  14.7 23.6 17.7   38.  1.207 14.8 1.196    -0.  -0.
1.  30.80.CLDV MARQUIS W      351.  8.RACW   20.  14.7 23.6 17.7   52.  1.233 15.1 1.180    -0.  -0.
1.  30.81.FLDV ESCORT          98.  4.FACS    1.  26.0 36.0 29.7  100.  1.543 22.3 1.333    -0.  -0.
1.  30.81.FLDV ESCORT          98.  4.FMCS    7.  28.5 43.4 33.7   75.  1.221 26.8 1.260    -0.  -0.
1.  30.78.FLDV FIESTA          98.  4.FMCS   34.  33.6 45.7 38.1   52.  1.127 30.9 1.235  2063.   3.

1.  30.79.FLDV FIESTA          98.  4.FMCS   31.  28.0 39.2 32.1   45.  1.098 31.4 1.025  2000.   3.
1.  30.80.FLDV FIESTA          98.  4.FMCS   62.  25.8 37.6 29.5   49.  1.154 28.7 1.027    -0.  -0.
1.  30.81.FLDV LYNX            98.  4.FMCS    3.  30.0 44.0 35.0   75.  1.279 27.6 1.268    -0.  -0.
1.  30.77.FLDV BOBCAT         140.  4.RACS    1.  23.0 32.0 26.3   55.  1.006 20.6 1.278  2750.   2.
1.  30.78.FLDV BOBCAT         140.  4.RACS   23.  21.8 33.2 25.8   69.  1.315 18.1 1.423    -0.   3.
1.  30.79.FLDV BOBCAT         140.  4.RACS   15.  20.7 28.7 23.7   70.  1.337 18.8 1.258    -0.   3.
1.  30.80.FLDV BOBCAT         140.  4.RACS   50.  21.8 31.8 25.4   57.  1.246 18.9 1.340    -0.  -0.
1.  30.79.FLDV CAPRI          140.  4.RACS   30.  20.4 28.8 23.5   53.  1.192 20.0 1.178    -0.   3.
1.  30.80.FLDV CAPRI          140.  4.RACS   42.  21.4 31.1 25.0   61.  1.230 19.9 1.249    -0.  -0.
1.  30.78.FLDV FAIRMONT       140.  4.RACS   24.  21.8 33.2 25.8   59.  1.210 18.7 1.376    -0.   5.

1.  30.79.FLDV FAIRMONT       140.  4.RACS   31.  20.4 28.8 23.5   53.  1.197 18.9 1.249  3000.   5.
1.  30.80.FLDV FAIRMONT       140.  4.RACS   43.  21.6 31.4 25.1   52.  1.175 19.8 1.267  3000.   5.
1.  30.76.FLDV MUSTANG        140.  4.RACS    2.  22.0 31.0 25.3   55.  1.071 20.0 1.267  3000.   2.
1.  30.78.FLDV MUSTANG        140.  4.RACS   30.  21.8 33.2 25.8   56.  1.205 18.2 1.420    -0.   3.
1.  30.79.FLDV MUSTANG        140.  4.RACS   30.  20.5 28.8 23.6   60.  1.249 19.7 1.200    -0.   3.
1.  30.80.FLDV MUSTANG        140.  4.RACS   38.  21.6 30.8 25.0   52.  1.215 19.5 1.283    -0.  -0.
1.  30.81.FLDV MUSTANG        140.  4.RACS    1.  22.0 31.0 25.3   50.  0.964 24.4 1.037    -0.  -0.
1.  30.76.FLDV PINTO          140.  4.RACS    3.  22.0 32.0 25.6   55.  1.063 18.9 1.353  3000.   2.
1.  30.77.FLDV PINTO          140.  4.RACS    3.  23.0 32.0 26.3   55.  1.074 19.6 1.340  3000.   2.
1.  30.78.FLDV PINTO          140.  4.RACS   32.  21.7 32.9 25.7   63.  1.284 18.3 1.402  3000.   3.

1.  30.79.FLDV PINTO          140.  4.RACS   30.  20.7 28.7 23.7   62.  1.285 19.7 1.205    -0.   3.
1.  30.80.FLDV PINTO          140.  4.RACS   45.  22.1 31.0 25.4   62.  1.316 17.7 1.434    -0.  -0.
1.  30.79.FLDV ZEPHYR         140.  4.RACS   30.  20.4 28.8 23.5   56.  1.195 19.2 1.223    -0.   5.
1.  30.80.FLDV ZEPHYR         140.  4.RACS   51.  21.6 31.3 25.1   56.  1.203 19.1 1.314    -0.  -0.
1.  30.79.FLDV BOBCAT         140.  4.RACW    5.  20.4 28.8 23.5   67.  1.227 18.6 1.261    -0.   7.
1.  30.80.FLDV BOBCAT W       140.  4.RACW   13.  21.7 31.6 25.3   54.  1.196 19.3 1.310    -0.  -0.
1.  30.80.FLDV FAIRMONT W     140.  4.RACW   12.  21.4 31.1 24.9   59.  1.256 17.4 1.429    -0.  -0.
1.  30.78.FLDV PINTO          140.  4.RACW   30.  21.8 33.2 25.8   71.  1.348 17.7 1.454    -0.   7.
1.  30.79.FLDV PINTO          140.  4.RACW   18.  20.4 28.8 23.5   48.  1.128 21.3 1.103    -0.   7.
1.  30.76.FLDV PINTO W        140.  4.RACW    1.  22.0 31.0 25.3   55.  1.075 17.2 1.472  3000.   7.
```

```
1.  30.77.FLDV PINTO W          140. 4.RACW    4. 21.0 29.0 24.0  55. 1.025 20.4 1.176 3000.  7.
1.  30.78.FLDV PINTO W          140. 4.RACW    1. 22.0 31.0 25.3  55. 1.111 18.4 1.376 3000.  7.
1.  30.80.FLDV PINTO W          140. 4.RACW   33. 21.7 31.6 25.3  56. 1.297 18.3 1.380   -0. -0.
1.  30.80.FLDV ZEPHYR W         140. 4.RACW    7. 21.3 30.8 24.8  58. 1.326 16.8 1.475   -0. -0.
1.  30.77.FLDV BOBCAT           140. 4.RMCS    1. 26.0 37.0 30.0  55. 1.075 25.5 1.177 3000.  2.
1.  30.79.FLDV BOBCAT           140. 4.RMCS    9. 21.5 32.4 25.3  55. 1.209 23.3 1.089   -0.  3.
1.  30.80.FLDV BOBCAT           140. 4.RMCS   58. 23.8 37.8 28.6  51. 1.200 21.6 1.325   -0. -0.
1.  30.79.FLDV CAPRI            140. 4.RMCS   30. 19.4 29.9 23.1  46. 1.137 21.4 1.078   -0.  3.
1.  30.80.FLDV CAPRI            140. 4.RMCS   49. 22.5 37.2 27.4  50. 1.166 22.0 1.243   -0. -0.
1.  30.81.FLDV CAPRI            140. 4.RMCS    1. 23.0 34.0 26.9  50. 0.876 24.7 1.091   -0. -0.

1.  30.78.FLDV FAIRMONT         140. 4.RMCS   26. 22.7 33.2 26.4  62. 1.157 20.3 1.304 3500.  5.
1.  30.79.FLDV FAIRMONT         140. 4.RMCS   31. 20.2 30.8 23.9  49. 1.166 21.1 1.132 3000.  5.
1.  30.80.FLDV FAIRMONT         140. 4.RMCS   40. 23.0 37.9 28.0  50. 1.166 22.1 1.269 3000.  5.
1.  30.81.FLDV FAIRMONT         140. 4.RMCS    2. 23.0 34.0 26.9  75. 1.321 19.7 1.372   -0. -0.
1.  30.81.FLDV GRANADA          140. 4.RMCS    1. 23.0 34.0 26.9  25. 0.972 22.4 1.202   -0. -0.
1.  30.78.FLDV MUSTANG          140. 4.RMCS   30. 22.7 33.2 26.4  52. 1.181 20.5 1.289   -0.  3.
1.  30.79.FLDV MUSTANG          140. 4.RMCS   33. 19.8 30.4 23.5  46. 1.122 20.7 1.136 3000.  3.
1.  30.80.FLDV MUSTANG          140. 4.RMCS   53. 22.8 37.3 27.7  53. 1.172 21.9 1.261 3000. -0.
1.  30.76.FLDV PINTO            140. 4.RMCS    1. 24.0 35.0 27.9  75. 1.076 26.6 1.052 2750. -0.
1.  30.77.FLDV PINTO            140. 4.RMCS    4. 26.0 37.0 30.0  55. 1.066 21.6 1.387 2938.  2.

1.  30.78.FLDV PINTO            140. 4.RMCS   32. 25.3 35.3 29.0  60. 1.226 21.2 1.373 2750.  3.
1.  30.79.FLDV PINTO            140. 4.RMCS   30. 21.5 32.4 25.3  55. 1.213 22.2 1.143   -0.  3.
1.  30.80.FLDV PINTO            140. 4.RMCS   48. 23.9 37.7 28.7  52. 1.224 22.4 1.279   -0. -0.
1.  30.78.FLDV ZEPHYR           140. 4.RMCS   30. 22.7 33.2 26.4  47. 1.154 20.5 1.291   -0.  5.
1.  30.79.FLDV ZEPHYR           140. 4.RMCS   11. 20.2 30.8 23.9  59. 1.196 22.7 1.050   -0.  5.
1.  30.80.FLDV ZEPHYR           140. 4.RMCS   51. 23.0 37.9 28.0  43. 1.107 22.8 1.229   -0. -0.
1.  30.78.FLDV BOBCAT           140. 4.RMCW   19. 22.7 33.2 26.4  64. 1.265 21.0 1.257   -0.  7.
1.  30.79.FLDV BOBCAT           140. 4.RMCW   13. 20.2 30.8 23.9  40. 1.108 22.6 1.057   -0.  7.
1.  30.80.FLDV BOBCAT W         140. 4.RMCW   11. 23.0 37.9 28.0  42. 1.144 21.4 1.305   -0. -0.
1.  30.79.FLDV FAIRMONT         140. 4.RMCW   14. 20.2 30.8 23.9  45. 1.096 23.4 1.022   -0.  8.

1.  30.80.FLDV FAIRMONT W       140. 4.RMCW   33. 23.0 37.9 28.0  52. 1.137 22.8 1.228   -0. -0.
1.  30.78.FLDV PINTO            140. 4.RMCW   30. 22.7 33.2 26.4  52. 1.170 21.2 1.245   -0.  7.
1.  30.79.FLDV PINTO            140. 4.RMCW   29. 20.2 30.8 23.9  54. 1.208 21.1 1.134   -0.  7.
1.  30.77.FLDV PINTO W          140. 4.RMCW    2. 23.0 33.0 26.6  55. 1.049 19.2 1.390 3000.  7.
1.  30.80.FLDV PINTO W          140. 4.RMCW   45. 23.0 37.9 28.0  49. 1.204 21.6 1.291   -0. -0.
1.  30.79.FLDV ZEPHYR           140. 4.RMCW    4. 20.2 30.8 23.9  44. 1.063 21.7 1.103   -0.  8.
1.  30.80.FLDV ZEPHYR W         140. 4.RMCW    5. 23.0 37.9 28.0  61. 1.244 22.7 1.229   -0. -0.
1.  30.78.FLDV BOBCAT           171. 6.RACS   26. 17.9 22.0 19.5  68. 1.311 14.5 1.351   -0.  3.
1.  30.79.FLDV BOBCAT           171. 6.RACS    5. 18.1 23.0 20.0  66. 1.507 14.0 1.432   -0.  3.
1.  30.79.FLDV CAPRI            171. 6.RACS   30. 18.1 23.0 20.0  57. 1.243 17.6 1.138   -0.  3.


1.  30.77.FLDV MUSTANG          171. 6.RACS    2. 17.0 23.0 19.3  55. 1.037 17.8 1.079 3000.  2.
1.  30.78.FLDV MUSTANG          171. 6.RACS   30. 16.0 20.4 17.7  64. 1.271 14.9 1.186   -0.  3.
1.  30.79.FLDV MUSTANG          171. 6.RACS   31. 18.1 23.0 20.0  60. 1.241 17.4 1.148 3000.  3.
1.  30.78.FLDV PINTO            171. 6.RACS   31. 17.9 22.0 19.5  68. 1.297 15.4 1.265   -0.  3.
1.  30.79.FLDV PINTO            171. 6.RACS   25. 18.1 23.0 20.0  67. 1.364 16.5 1.215   -0.  3.
1.  30.78.FLDV BOBCAT           171. 6.RACW   29. 17.9 22.0 19.5  64. 1.280 14.7 1.329   -0.  7.
1.  30.79.FLDV BOBCAT           171. 6.RACW    5. 18.1 23.0 20.0  40. 1.230 17.9 1.119   -0.  7.
1.  30.78.FLDV PINTO            171. 6.RACW   30. 17.9 22.0 19.5  69. 1.283 15.6 1.255   -0.  7.
1.  30.79.FLDV PINTO            171. 6.RACW   10. 18.1 23.0 20.0  78. 1.398 15.4 1.298   -0.  7.
1.  30.78.FLDV PINTO W          171. 6.RACW    2. 18.0 22.0 19.6  55. 1.077 21.3 0.920 3500.  7.

1.  30.79.FLDV CAPRI            171. 6.RMCS   30. 18.1 23.0 20.0  49. 1.179 20.2 0.993   -0.  3.
1.  30.78.FLDV MUSTANG          171. 6.RMCS   31. 19.6 26.1 22.0  51. 1.183 18.0 1.227   -0.  3.
1.  30.79.FLDV MUSTANG          171. 6.RMCS   30. 18.1 23.0 20.0  57. 1.217 19.9 1.006   -0.  3.
1.  30.79.FLDV CAPRI            200. 6.RACS   13. 18.0 23.6 20.2  39. 1.068 18.7 1.078   -0.  3.
1.  30.80.FLDV CAPRI            200. 6.RACS   37. 20.2 26.9 22.8  56. 1.253 18.1 1.257   -0. -0.
1.  30.80.FLDV COUGAR           200. 6.RACS    6. 18.1 24.0 20.3  57. 1.183 14.7 1.378   -0. -0.
1.  30.78.FLDV FAIRMONT         200. 6.RACS   35. 19.2 26.0 21.8  61. 1.218 16.5 1.310 3200.  5.
1.  30.79.FLDV FAIRMONT         200. 6.RACS   35. 18.0 23.7 20.2  57. 1.201 17.4 1.161 3100.  5.
1.  30.80.FLDV FAIRMONT         200. 6.RACS   63. 20.1 30.9 23.9  52. 1.195 17.8 1.342   -0. -0.
1.  30.81.FLDV FAIRMONT         200. 6.RACS    6. 18.9 25.8 21.5  50. 1.031 15.5 1.393   -0. -0.
```

```
1. 30.81.FLDV GRANADA        200. 6.RACS   1. 19.0 25.0 21.3   0. 1.050 19.5 1.090   -0. -0.
1. 30.79.FLDV MUSTANG        200. 6.RACS  12. 18.0 23.6 20.2  66. 1.221 17.5 1.155   -0.  3.
1. 30.80.FLDV MUSTANG        200. 6.RACS  41. 20.1 26.9 22.7  59. 1.280 18.0 1.267   -0. -0.
1. 30.81.FLDV MUSTANG        200. 6.RACS   5. 20.0 28.0 22.9  70. 1.228 15.3 1.500   -0. -0.
1. 30.80.FLDV THUNDERBIRD    200. 6.RACS   3. 18.1 24.0 20.3  46. 1.242 16.7 1.211   -0. -0.
1. 30.78.FLDV ZEPHYR         200. 6.RACS  31. 19.2 26.0 21.8  58. 1.229 16.4 1.328   -0.  5.
1. 30.79.FLDV ZEPHYR         200. 6.RACS  30. 18.0 23.6 20.2  53. 1.189 18.0 1.119   -0.  5.
1. 30.80.FLDV ZEPHYR         200. 6.RACS  62. 20.1 27.0 22.7  57. 1.209 18.2 1.252   -0. -0.
1. 30.81.FLDV ZEPHYR         200. 6.RACS   2. 18.9 25.8 21.5  75. 1.152 14.9 1.451   -0. -0.
1. 30.78.FLDV FAIRMONT       200. 6.RACW  30. 18.0 23.5 20.1  57. 1.208 16.0 1.257   -0.  8.

1. 30.79.FLDV FAIRMONT       200. 6.RACW  30. 17.4 22.7 19.5  53. 1.193 17.7 1.101   -0.  8.
1. 30.80.FLDV FAIRMONT W     200. 6.RACW  43. 20.1 26.9 22.7  53. 1.229 18.3 1.240   -0. -0.
1. 30.78.FLDV ZEPHYR         200. 6.RACW  30. 18.0 23.5 20.1  56. 1.211 15.8 1.271   -0.  8.
1. 30.79.FLDV ZEPHYR         200. 6.RACW  30. 17.4 22.6 19.4  50. 1.158 17.9 1.083   -0.  8.
1. 30.80.FLDV ZEPHYR W       200. 6.RACW  30. 20.2 26.9 22.8  54. 1.198 18.6 1.221   -0. -0.
1. 30.80.FLDV CAPRI          200. 6.RMCS  33. 20.9 29.8 24.1  54. 1.191 20.2 1.198 3000. -0.
1. 30.78.FLDV FAIRMONT       200. 6.RMCS  31. 20.6 28.8 23.6  56. 1.144 18.9 1.250 3000.  5.
1. 30.79.FLDV FAIRMONT       200. 6.RMCS  30. 19.4 27.4 22.4  42. 1.125 19.8 1.128   -0.  5.
1. 30.80.FLDV FAIRMONT       200. 6.RMCS  32. 20.9 29.8 24.1  54. 1.186 21.4 1.130   -0. -0.
1. 30.80.FLDV MUSTANG        200. 6.RMCS  31. 20.9 29.8 24.1  47. 1.174 21.8 1.112   -0. -0.

1. 30.81.FLDV MUSTANG        200. 6.RMCS   2. 20.0 30.0 23.5  88. 1.424 16.8 1.400   -0. -0.
1. 30.78.FLDV ZEPHYR         200. 6.RMCS  30. 20.6 28.8 23.6  46. 1.123 20.0 1.182   -0.  5.
1. 30.79.FLDV ZEPHYR         200. 6.RMCS  30. 19.4 27.4 22.4  49. 1.146 20.5 1.093   -0.  5.
1. 30.80.FLDV ZEPHYR         200. 6.RMCS  31. 20.9 29.8 24.1  55. 1.240 20.7 1.169   -0. -0.
1. 30.78.FLDV FAIRMONT       200. 6.RMCW  24. 19.2 29.1 22.7  55. 1.186 19.2 1.183   -0.  8.
1. 30.79.FLDV FAIRMONT       200. 6.RMCW  30. 18.6 27.8 21.9  47. 1.171 19.3 1.131   -0.  8.
1. 30.80.FLDV FAIRMONT W     200. 6.RMCW  31. 20.9 29.8 24.1  40. 1.078 21.1 1.145   -0. -0.
1. 30.78.FLDV ZEPHYR         200. 6.RMCW  22. 19.2 29.1 22.7  63. 1.252 17.9 1.270   -0.  8.
1. 30.79.FLDV ZEPHYR         200. 6.RMCW  23. 17.8 28.3 21.4  54. 1.188 19.0 1.126   -0.  8.
1. 30.80.FLDV ZEPHYR W       200. 6.RMCW  30. 20.9 29.8 24.1  51. 1.176 20.4 1.185   -0. -0.

1. 30.75.FLDV GRANADA        250. 6.RACS   1. 15.0 20.0 16.9  50. 0.871 11.2 1.509 3500. -0.
1. 30.76.FLDV GRANADA        250. 6.RACS   1. 16.0 21.0 17.9  75. 1.008 16.5 1.087 3500. -0.
1. 30.78.FLDV GRANADA        250. 6.RACS  34. 18.4 26.2 21.3  60. 1.226 16.2 1.316 3500.  4.
1. 30.79.FLDV GRANADA        250. 6.RACS  31. 17.1 22.8 19.3  58. 1.194 16.5 1.161 3500.  4.
1. 30.80.FLDV GRANADA        250. 6.RACS  61. 17.0 23.0 19.3  54. 1.237 16.6 1.160   -0. -0.
1. 30.77.FLDV MAVERICK       250. 6.RACS   1. 17.0 22.0 18.9  55. 1.028 17.9 1.058 3500.  2.
1. 30.78.FLDV MONARCH        250. 6.RACS  31. 18.5 26.2 21.3  59. 1.209 16.0 1.333 3500.  4.
1. 30.79.FLDV MONARCH        250. 6.RACS  32. 17.1 22.8 19.3  52. 1.147 16.4 1.176 3500.  4.
1. 30.80.FLDV MONARCH        250. 6.RACS  60. 16.9 23.0 19.2  52. 1.237 16.0 1.203   -0. -0.
1. 30.78.FLDV GRANADA        250. 6.RMCS  30. 18.5 26.2 21.3  49. 1.206 16.9 1.261   -0.  4.

1. 30.79.FLDV GRANADA        250. 6.RMCS  18. 17.5 25.4 20.3  58. 1.239 17.7 1.154 3500.  4.
1. 30.80.FLDV GRANADA        250. 6.RMCS  14. 18.7 27.8 22.0  54. 1.322 17.6 1.241   -0. -0.
1. 30.78.FLDV MONARCH        250. 6.RMCS  30. 18.5 26.2 21.3  47. 1.132 18.2 1.175   -0.  4.
1. 30.79.FLDV MONARCH        250. 6.RMCS  26. 17.5 25.4 20.3  37. 1.119 18.5 1.097   -0.  4.
1. 30.80.FLDV MONARCH        250. 6.RMCS  14. 18.6 27.8 21.9  59. 1.232 18.5 1.182   -0. -0.
1. 30.80.FLDV CAPRI          255. 8.RACS  32. 17.5 26.5 20.7  54. 1.177 17.9 1.157   -0. -0.
1. 30.80.FLDV COUGAR         255. 8.RACS  42. 17.6 26.4 20.8  59. 1.259 15.6 1.330 3750.  5.
1. 30.80.FLDV FAIRMONT       255. 8.RACS  17. 17.7 26.3 20.8  57. 1.103 17.2 1.206 3500.  5.
1. 30.80.FLDV FUTURA         255. 8.RACS   1. 18.0 26.0 20.9 100. 1.404 16.6 1.259   -0. -0.
1. 30.80.FLDV MUSTANG        255. 8.RACS  33. 17.9 26.3 20.9  57. 1.227 17.0 1.232 3000. -0.

1. 30.80.FLDV THUNDERBIRD    255. 8.RACS  44. 17.7 26.3 20.8  48. 1.208 16.2 1.283 3500. -0.
1. 30.80.FLDV ZEPHYR         255. 8.RACS  32. 17.5 26.5 20.7  61. 1.240 16.2 1.278   -0. -0.
1. 30.80.FLDV FAIRMONT W     255. 8.RACW  31. 18.2 25.7 20.9  51. 1.193 17.0 1.238   -0. -0.
1. 30.80.FLDV ZEPHYR W       255. 8.RACW  30. 18.2 25.7 20.9  54. 1.213 16.5 1.270   -0. -0.
1. 30.79.FLDV CAPRI          302. 8.RACS  31. 16.1 23.0 18.6  54. 1.192 16.0 1.163 3500.  3.
1. 30.78.FLDV COUGAR         302. 8.RACS  31. 14.6 22.1 17.2  57. 1.173 13.4 1.288 4500.  5.
1. 30.79.FLDV COUGAR         302. 8.RACS  30. 14.3 20.1 16.4  52. 1.183 14.6 1.125   -0.  5.
1. 30.80.FLDV COUGAR         302. 8.RACS  46. 17.1 28.3 20.8  53. 1.196 16.6 1.256   -0. -0.
1. 30.78.FLDV FAIRMONT       302. 8.RACS  30. 16.1 22.9 18.6  57. 1.213 15.6 1.192   -0.  5.
1. 30.79.FLDV FAIRMONT       302. 8.RACS  32. 16.0 22.8 18.5  55. 1.193 16.1 1.147 3500.  5.
```

```
1. 30.76.FLDV GRANADA          302. 8.RACS   2. 15.0 21.0 17.2  75. 1.003 12.2 1.413 3500. -0.
1. 30.77.FLDV GRANADA          302. 8.RACS   4. 16.0 22.0 18.2  66. 1.102 12.7 1.436 4000.  4.
1. 30.78.FLDV GRANADA          302. 8.RACS  32. 16.0 22.8 18.5  51. 1.178 14.5 1.272 4000.  4.
1. 30.79.FLDV GRANADA          302. 8.RACS  30. 15.6 22.0 18.0  54. 1.204 14.7 1.221   -0.  4.
1. 30.80.FLDV GRANADA          302. 8.RACS  23. 16.8 24.8 19.7  49. 1.254 14.7 1.338   -0. -0.
1. 30.78.FLDV LTD              302. 8.RACS  32. 14.6 22.1 17.2  50. 1.142 14.1 1.224 4497.  6.
1. 30.79.FLDV LTD              302. 8.RACS  32. 15.4 21.5 17.7  56. 1.172 15.2 1.159 4000.  6.
1. 30.80.FLDV LTD              302. 8.RACS  65. 17.0 24.9 19.8  48. 1.156 15.6 1.268 4000.  6.
1. 30.78.FLDV LTD II           302. 8.RACS  32. 14.6 22.1 17.2  52. 1.145 13.1 1.308 4500.  5.
1. 30.79.FLDV LTD II           302. 8.RACS  31. 14.3 20.1 16.4  52. 1.177 14.7 1.121 4500.  5.

1. 30.79.FLDV MARQUIS          302. 8.RACS  30. 15.4 21.5 17.7  50. 1.138 15.5 1.139   -0.  6.
1. 30.80.FLDV MARQUIS          302. 8.RACS  60. 16.9 25.1 19.8  51. 1.147 15.9 1.246   -0. -0.
1. 30.78.FLDV MONARCH          302. 8.RACS  30. 16.0 22.8 18.5  56. 1.181 14.6 1.265   -0.  4.
1. 30.79.FLDV MONARCH          302. 8.RACS  30. 15.6 21.9 17.9  52. 1.138 15.6 1.150   -0.  4.
1. 30.80.FLDV MONARCH          302. 8.RACS  34. 16.8 24.7 19.6  53. 1.184 14.9 1.315   -0. -0.
1. 30.78.FLDV MUSTANG          302. 8.RACS  30. 16.1 22.9 18.6  60. 1.206 14.0 1.331   -0.  3.
1. 30.79.FLDV MUSTANG          302. 8.RACS  32. 16.1 23.0 18.6  59. 1.218 16.1 1.153 3500.  3.
1. 30.77.FLDV THUNDERBIRD      302. 8.RACS   2. 15.0 19.0 16.6  65. 1.043 14.1 1.174 4500.  4.
1. 30.78.FLDV THUNDERBIRD      302. 8.RACS  33. 14.6 22.1 17.2  61. 1.170 13.5 1.276 4500.  5.
1. 30.79.FLDV THUNDERBIRD      302. 8.RACS  31. 14.3 20.1 16.4  51. 1.142 15.1 1.090 4500.  5.

1. 30.80.FLDV THUNDERBIRD      302. 8.RACS  58. 17.1 28.6 20.9  44. 1.120 17.7 1.182 3500. -0.
1. 30.78.FLDV VERSAILLES       302. 8.RACS  30. 15.9 22.8 18.4  49. 1.065 14.7 1.252   -0.  4.
1. 30.79.FLDV VERSAILLES       302. 8.RACS  30. 14.3 18.9 16.1  55. 1.192 14.0 1.149   -0.  4.
1. 30.80.FLDV VERSAILLES       302. 8.RACS  53. 14.9 20.3 17.0  51. 1.223 13.6 1.252   -0. -0.
1. 30.78.FLDV ZEPHYR           302. 8.RACS  31. 16.1 22.9 18.6  58. 1.195 15.7 1.181   -0.  5.
1. 30.79.FLDV ZEPHYR           302. 8.RACS  30. 16.0 22.8 18.5  48. 1.134 16.9 1.091   -0.  5.
1. 30.78.FLDV FAIRMONT         302. 8.RACW  30. 16.1 22.9 18.6  58. 1.223 15.1 1.229   -0.  8.
1. 30.79.FLDV FAIRMONT         302. 8.RACW  30. 16.0 22.8 18.5  56. 1.207 16.5 1.118   -0.  8.
1. 30.79.FLDV LTD              302. 8.RACW  30. 14.3 20.1 16.4  56. 1.186 14.0 1.172   -0.  9.
1. 30.80.FLDV LTD W            302. 8.RACW  35. 16.7 23.9 19.3  60. 1.197 14.4 1.342   -0. -0.

1. 30.79.FLDV MARQUIS          302. 8.RACW  30. 14.3 20.1 16.4  49. 1.141 15.0 1.094   -0.  9.
1. 30.80.FLDV MARQUIS W        302. 8.RACW  30. 16.6 23.9 19.3  56. 1.135 15.1 1.275   -0. -0.
1. 30.78.FLDV ZEPHYR           302. 8.RACW  30. 16.1 22.9 18.6  56. 1.189 15.4 1.205   -0.  8.
1. 30.79.FLDV ZEPHYR           302. 8.RACW  30. 16.0 22.8 18.5  51. 1.187 16.2 1.138   -0.  8.
1. 30.80.FLDV CONTINENTAL      302. 8.RAIS  54. 16.0 24.4 18.9  53. 1.178 15.9 1.192   -0. -0.
1. 30.80.FLDV MARK             302. 8.RAIS  48. 16.2 24.2 19.0  57. 1.168 15.1 1.255   -0. -0.
1. 30.79.FLDV CAPRI            302. 8.RMCS  30. 15.3 27.1 19.1  42. 1.092 18.5 1.031   -0.  3.
1. 30.79.FLDV GRANADA          302. 8.RMCS   9. 14.8 25.6 18.3  49. 1.186 17.0 1.076   -0.  4.
1. 30.78.FLDV MONARCH          302. 8.RMCS  18. 16.0 25.0 19.1  57. 1.163 15.3 1.247   -0.  4.
1. 30.79.FLDV MONARCH          302. 8.RMCS  10. 14.8 25.7 18.3  51. 1.109 16.2 1.130   -0.  4.

1. 30.78.FLDV MUSTANG          302. 8.RMCS  30. 15.8 23.3 18.5  63. 1.216 14.4 1.281   -0.  3.
1. 30.79.FLDV MUSTANG          302. 8.RMCS  30. 15.3 27.1 19.1  49. 1.175 17.7 1.079   -0.  3.
1. 30.79.FLDV ZEPHYR           302. 8.RMCS   5. 15.0 26.5 18.7  57. 1.095 17.2 1.088   -0.  5.
1. 30.79.FLDV FAIRMONT         302. 8.RMCW   3. 15.0 26.5 18.7  70. 1.472 15.2 1.232   -0.  8.
1. 30.79.FLDV ZEPHYR           302. 8.RMCW   7. 15.0 26.5 18.7  37. 1.073 17.9 1.042   -0.  8.
1. 30.80.FLDV CONTINENTAL      351. 8.RACS  57. 15.0 24.9 18.2  51. 1.159 15.6 1.168   -0. -0.
1. 30.77.FLDV COUGAR           351. 8.RACS   1. 14.0 20.0 16.2 100. 1.500  9.7 1.673 4500. -0.
1. 30.78.FLDV COUGAR           351. 8.RACS  34. 14.5 21.6 17.0  55. 1.149 13.7 1.246 4500.  5.
1. 30.79.FLDV COUGAR           351. 8.RACS  20. 13.2 19.6 15.5  47. 1.124 14.4 1.066 4500.  5.
1. 30.75.FLDV ELITE            351. 8.RACS   1. 11.0 16.0 12.8 100. 1.236 11.2 1.140 4500. -0.

1. 30.76.FLDV ELITE            351. 8.RACS   2. 13.0 19.0 15.1  63. 0.980 13.5 1.116 4500. -0.
1. 30.75.FLDV GRANADA          351. 8.RACS   1. 12.0 16.0 13.5  75. 1.044  9.0 1.499 3500. -0.
1. 30.77.FLDV LTD              351. 8.RACS   3. 13.0 19.0 15.1  53. 1.021 12.8 1.189 5000.  6.
1. 30.78.FLDV LTD              351. 8.RACS  34. 14.5 22.0 17.2  51. 1.138 12.7 1.358 4819.  6.
1. 30.79.FLDV LTD              351. 8.RACS  30. 13.7 20.1 16.0  52. 1.170 12.9 1.241   -0.  6.
1. 30.80.FLDV LTD              351. 8.RACS  39. 15.8 26.3 19.3  51. 1.130 16.3 1.183   -0. -0.
1. 30.77.FLDV LTD II           351. 8.RACS   2. 14.0 20.0 16.2  53. 1.042 13.4 1.208 4500.  5.
1. 30.78.FLDV LTD II           351. 8.RACS  30. 14.8 22.4 17.5  57. 1.217 13.3 1.318   -0.  5.
1. 30.79.FLDV LTD II           351. 8.RACS  19. 13.0 18.9 15.1  59. 1.194 13.6 1.111   -0.  5.
1. 30.80.FLDV MARK             351. 8.RACS  41. 14.9 24.9 18.2  53. 1.166 15.4 1.183   -0. -0.
```

```
1. 30.78.FLDV MARQUIS       351. 8.RACS   30. 13.4 20.6 15.9  49. 1.118 13.1 1.209   -0.  6.
1. 30.79.FLDV MARQUIS       351. 8.RACS   32. 15.0 20.7 17.1  45. 1.122 14.3 1.204 4500.  6.
1. 30.80.FLDV MARQUIS       351. 8.RACS   43. 15.9 26.0 19.2  49. 1.113 16.6 1.162 4000. -0.
1. 30.75.FLDV MONTEGO       351. 8.RACS    1. 11.0 16.0 12.8 100. 1.244  9.6 1.336 4500. -0.
1. 30.77.FLDV THUNDERBIRD   351. 8.RACS    1. 14.0 20.0 16.2   0. 0.972 14.1 1.146 5000. -0.
1. 30.78.FLDV THUNDERBIRD   351. 8.RACS   30. 13.9 20.5 16.3  55. 1.174 12.6 1.292   -0.  5.
1. 30.79.FLDV THUNDERBIRD   351. 8.RACS   30. 13.0 19.1 15.2  52. 1.186 13.4 1.138   -0.  5.
1. 30.78.FLDV LTD           351. 8.RACW   30. 13.4 20.6 15.9  53. 1.159 12.3 1.291   -0.  9.
1. 30.79.FLDV LTD           351. 8.RACW   30. 13.2 19.7 15.5  51. 1.142 13.6 1.135   -0.  9.
1. 30.78.FLDV LTD W         351. 8.RACW    2. 13.0 21.0 15.7  55. 1.073 13.4 1.171 5000.  9.

1. 30.80.FLDV LTD W         351. 8.RACW   34. 14.9 24.6 18.1  49. 1.124 15.8 1.145   -0. -0.
1. 30.78.FLDV MARQUIS       351. 8.RACW   19. 13.4 20.6 15.9  34. 1.002 12.8 1.243   -0.  9.
1. 30.79.FLDV MARQUIS       351. 8.RACW   30. 14.6 20.1 16.6  50. 1.144 13.5 1.231   -0.  9.
1. 30.80.FLDV MARQUIS W     351. 8.RACW   36. 14.9 24.7 18.1  49. 1.132 15.8 1.152   -0. -0.
1. 30.78.FLDV CONTINENTAL   400. 8.RACS   30. 13.0 19.5 15.3  55. 1.159 11.4 1.350   -0.  6.
1. 30.79.FLDV CONTINENTAL   400. 8.RACS   30. 11.6 16.8 13.5  50. 1.144 11.5 1.172   -0.  6.
1. 30.78.FLDV COUGAR        400. 8.RACS   30. 13.1 16.8 14.6  61. 1.219 11.7 1.245   -0.  5.
1. 30.75.FLDV ELITE         400. 8.RACS    1. 10.0 14.0 11.5  50. 0.833 11.0 1.047 4500. -0.
1. 30.76.FLDV LTD           400. 8.RACS    1. 13.0 17.0 14.5  25. 1.048 12.0 1.210 4500. -0.
1. 30.77.FLDV LTD           400. 8.RACS    1. 13.0 18.0 14.9  75. 1.061 11.6 1.279 5000. -0.

1. 30.78.FLDV LTD           400. 8.RACS   31. 13.0 19.5 15.3  62. 1.220 11.8 1.300 5000.  6.
1. 30.78.FLDV LTD II        400. 8.RACS    1. 13.0 17.0 14.5 100. 1.548 12.0 1.213 4500. -0.
1. 30.78.FLDV MARK          400. 8.RACS   30. 13.0 19.5 15.3  57. 1.167 11.4 1.340   -0.  5.
1. 30.79.FLDV MARK          400. 8.RACS   32. 11.6 16.8 13.5  50. 1.139 11.5 1.169 5000.  5.
1. 30.78.FLDV MARQUIS       400. 8.RACS   30. 13.0 19.5 15.3  57. 1.182 11.8 1.299   -0.  6.
1. 30.78.FLDV THUNDERBIRD   400. 8.RACS   30. 13.1 16.8 14.6  54. 1.205 12.2 1.193   -0.  5.
1. 30.78.FLDV LTD           400. 8.RACW   30. 13.0 19.5 15.3  52. 1.161 11.7 1.306   -0.  9.
1. 30.78.FLDV MARQUIS       400. 8.RACW   30. 13.0 19.5 15.3  51. 1.143 11.4 1.350   -0.  9.
1. 30.78.FLDV CONTINENTAL   460. 8.RACS   32. 11.4 17.3 13.5  55. 1.167 11.2 1.203 5250.  6.
1. 30.78.FLDV LTD           460. 8.RACS   30. 11.6 17.1 13.6  49. 1.201 10.7 1.272   -0.  6.

1. 30.78.FLDV MARK          460. 8.RACS   31. 11.6 17.1 13.6  50. 1.152 11.5 1.181 5000.  5.
1. 30.77.FLDV MARQUIS       460. 8.RACS    1. 11.0 16.0 12.8  75. 1.125 10.6 1.212 5500. -0.
1. 30.78.FLDV MARQUIS       460. 8.RACS   30. 11.6 17.1 13.6  54. 1.183 10.9 1.246   -0.  6.
1. 30.75.FLDV THUNDERBIRD   460. 8.RACS    1. 10.0 15.0 11.8  75. 1.055  8.4 1.395 5500. -0.
1. 30.78.FLDV LTD           460. 8.RACW   30. 11.4 17.3 13.5  56. 1.202 10.5 1.285   -0.  9.
1. 30.78.FLDV MARQUIS       460. 8.RACW   30. 11.4 17.3 13.5  57. 1.231 10.5 1.278   -0.  9.
1. 40.80.CLDD ELDORADO      350. 8.FADS    1. 21.0 31.0 24.6   0. 0.753 19.1 1.286   -0. -0.
1. 40.80.CLDD SEVILLE       350. 8.FADS    2. 21.0 31.0 24.6  20. 1.071 21.4 1.145   -0. -0.
1. 40.80.CLDD TORONADO      350. 8.FADS    2. 21.0 31.0 24.6  49. 1.161 20.9 1.179   -0. -0.
1. 40.80.CLDD BONNEVILLE    350. 8.RADS    1. 23.0 34.0 26.9  41. 1.056 20.1 1.342   -0. -0.

1. 40.80.CLDD CUTLASS       350. 8.RADS    3. 23.0 34.0 26.9  37. 1.099 21.5 1.256   -0. -0.
1. 40.78.CLDD DELTA 88      350. 8.RADS    1. 21.0 29.9 24.3  55. 1.256 22.7 1.066   -0. -0.
1. 40.80.CLDD DELTA 88      350. 8.RADS    4. 22.0 32.0 25.6  41. 1.128 25.4 1.008   -0. -0.
1. 40.80.CLDD LESABRE       350. 8.RADS    1. 22.0 32.0 25.6  56. 1.224 24.9 1.029   -0. -0.
1. 40.78.CLDD 98            350. 8.RADS    2. 21.0 29.9 24.3  55. 1.064 21.0 1.154   -0. -0.
1. 40.80.CLDD 98            350. 8.RADS    1. 21.0 31.0 24.6  32. 1.063 14.8 1.659   -0. -0.
1. 40.80.CLDD CUTLASS W     350. 8.RADW    1. 23.0 34.0 26.9  69. 1.331 17.4 1.547   -0. -0.
1. 40.76.CLDV CHEVETTE       85. 4.RMCS    7. 22.5 33.1 26.3  55. 1.236 24.4 1.076   -0. -0.
1. 40.76.CLDV CHEVETTE       98. 4.RACS    5. 23.4 29.4 25.8  55. 1.231 22.3 1.155   -0. -0.
1. 40.78.CLDV CHEVETTE       98. 4.RACS    2. 21.8 29.0 24.5  78. 1.043 19.2 1.284   -0. -0.

1. 40.79.CLDV CHEVETTE       98. 4.RACS    1. 25.0 29.0 26.6  25. 1.012 20.2 1.321   -0. -0.
1. 40.80.CLDV CHEVETTE       98. 4.RACS    9. 25.0 31.0 27.4  59. 1.245 21.8 1.258 2500. -0.
1. 40.81.CLDV CHEVETTE       98. 4.RACS    5. 26.0 33.0 28.7  75. 1.153 23.4 1.228   -0. -0.
1. 40.76.CLDV CHEVETTE       98. 4.RMCS    7. 24.1 34.1 27.8  55. 1.221 24.8 1.118   -0. -0.
1. 40.78.CLDV CHEVETTE       98. 4.RMCS    2. 26.8 35.8 30.2  55. 1.056 31.6 0.955   -0. -0.
1. 40.80.CLDV CHEVETTE       98. 4.RMCS    2. 26.0 37.0 30.0  26. 0.956 29.3 1.025 2250. -0.
1. 40.75.CLDV ASTRE         140. 4.RACS    6. 18.1 25.4 20.8  55. 1.324 17.8 1.167   -0. -0.
1. 40.76.CLDV ASTRE         140. 4.RACS    1. 18.7 27.2 21.8  55. 1.238 20.6 1.057   -0. -0.
1. 40.75.CLDV MONZA         140. 4.RACS    6. 18.0 25.1 20.6  55. 1.139 19.1 1.081   -0. -0.
1. 40.76.CLDV MONZA         140. 4.RACS    2. 18.7 27.2 21.8  55. 1.363 15.2 1.426   -0. -0.
```

```
1. 40.76.CLDV SUNBIRD        140. 4.RACS    1. 18.7 27.2 21.8  55. 1.221 21.0 1.035    -0. -0.
1. 40.75.CLDV VEGA           140. 4.RACS    4. 18.1 25.4 20.8  55. 1.236 17.0 1.225    -0. -0.
1. 40.76.CLDV VEGA           140. 4.RACS    1. 18.7 27.2 21.8  55. 1.181 18.8 1.159    -0. -0.
1. 40.75.CLDV ASTRE W        140. 4.RACW    3. 18.1 25.4 20.8  55. 1.272 17.5 1.189    -0. -0.
1. 40.75.CLDV ASTRE          140. 4.RMCS    9. 19.0 31.8 23.2  55. 1.269 21.0 1.104    -0. -0.
1. 40.75.CLDV MONZA          140. 4.RMCS    1. 19.0 31.8 23.2  55. 1.496 23.9 0.970    -0. -0.
1. 40.76.CLDV MONZA          140. 4.RMCS    3. 18.7 30.0 22.5  55. 1.223 24.1 0.933    -0. -0.
1. 40.76.CLDV SUNBIRD        140. 4.RMCS    1. 18.7 30.0 22.5  55. 1.251 17.3 1.296    -0. -0.
1. 40.75.CLDV VEGA           140. 4.RMCS    2. 19.0 31.8 23.2  55. 1.251 22.8 1.016    -0. -0.
1. 40.76.CLDV VEGA           140. 4.RMCS    1. 18.8 30.5 22.8  55. 1.029 27.1 0.839    -0. -0.

1. 40.75.CLDV ASTRE W        140. 4.RMCW    1. 19.0 31.8 23.2  55. 1.276 19.5 1.187    -0. -0.
1. 40.75.CLDV VEGA W         140. 4.RMCW    3. 19.0 31.8 23.2  55. 1.269 21.5 1.076    -0. -0.
1. 40.80.CLDV CITATION       151. 4.FACS   10. 22.0 33.0 25.9  43. 1.153 23.5 1.101    -0. -0.
1. 40.81.CLDV CITATION       151. 4.FACS    2. 22.0 32.0 25.6  38. 1.038 23.0 1.111    -0. -0.
1. 40.80.CLDV OMEGA          151. 4.FACS    5. 22.0 33.0 25.9  57. 1.215 22.3 1.163    -0. -0.
1. 40.81.CLDV OMEGA          151. 4.FACS    2. 22.0 33.0 25.9  50. 1.092 21.4 1.206    -0. -0.
1. 40.80.CLDV PHOENIX        151. 4.FACS    3. 22.0 33.0 25.9  74. 1.257 21.1 1.225    -0. -0.
1. 40.80.CLDV SKYLARK        151. 4.FACS    7. 22.0 33.0 25.9  60. 1.286 21.8 1.186    -0. -0.
1. 40.81.CLDV SKYLARK        151. 4.FACS    2. 22.0 32.0 25.6  63. 1.131 21.0 1.214    -0. -0.
1. 40.81.CLDV CITATION       151. 4.FMCS    3. 22.0 32.9 25.9  33. 0.979 26.8 0.966    -0. -0.

1. 40.80.CLDV OMEGA          151. 4.FMCS    2. 24.0 35.0 27.9  51. 1.191 24.4 1.147    -0. -0.
1. 40.80.CLDV PHOENIX        151. 4.FMCS    1. 24.0 35.0 27.9  17. 0.986 28.6 0.978    -0. -0.
1. 40.80.CLDV MONZA          151. 4.RACS    2. 22.0 33.0 25.9  63. 1.213 21.6 1.200    -0. -0.
1. 40.80.CLDV STARFIRE       151. 4.RACS    1. 22.0 33.0 25.9  89. 1.784 13.2 1.967    -0. -0.
1. 40.78.CLDV SUNBIRD        151. 4.RACS    1. 23.0 31.0 26.0  50. 1.060 18.7 1.388    -0. -0.
1. 40.79.CLDV SUNBIRD        151. 4.RACS    1. 20.0 26.0 22.3 100. 1.252 16.8 1.330    -0. -0.
1. 40.80.CLDV SUNBIRD        151. 4.RACS    3. 22.0 33.0 25.9  57. 1.360 19.1 1.355    -0. -0.
1. 40.80.CLDV MONZA          151. 4.RMCS    2. 21.0 34.0 25.4  97. 1.503 19.1 1.329    -0. -0.
1. 40.80.CLDV STARFIRE       151. 4.RMCS    1. 21.0 34.0 25.4  64. 1.459 18.7 1.357    -0. -0.
1. 40.80.CLDV CITATION       173. 6.FACS    5. 18.0 26.0 20.9  39. 1.108 19.8 1.053    -0. -0.

1. 40.81.CLDV CITATION       173. 6.FACS    1. 20.0 29.0 23.3  75. 1.674 18.2 1.275    -0. -0.
1. 40.80.CLDV OMEGA          173. 6.FACS    2. 18.0 26.0 20.9  31. 1.251 19.7 1.060    -0. -0.
1. 40.81.CLDV OMEGA          173. 6.FACS    1. 20.0 29.0 23.3 100. 1.305 18.9 1.231    -0. -0.
1. 40.80.CLDV PHOENIX        173. 6.FACS    1. 18.0 26.0 20.9  26. 1.110 17.7 1.178    -0. -0.
1. 40.81.CLDV PHOENIX        173. 6.FACS    1. 20.0 29.0 23.3 100. 1.105 22.4 1.037    -0. -0.
1. 40.80.CLDV SKYLARK        173. 6.FACS    6. 18.0 26.0 20.9  53. 1.177 20.3 1.028    -0. -0.
1. 40.81.CLDV SKYLARK        173. 6.FACS    2. 20.0 29.0 23.3  75. 1.316 18.8 1.237    -0. -0.
1. 40.80.CLDV BONNEVILLE     231. 6.RACS    1. 19.0 27.0 21.9  19. 0.952 17.5 1.255    -0. -0.
1. 40.80.CLDV CAMARO         231. 6.RACS    1. 19.0 26.0 21.6  68. 1.207 17.3 1.250    -0. -0.
1. 40.81.CLDV CAMARO         231. 6.RACS    1. 20.0 29.0 23.3  50. 1.101 18.3 1.272    -0. -0.

1. 40.75.CLDV CENTURY        231. 6.RACS    1. 14.3 19.1 16.1  55. 1.289 14.8 1.091    -0. -0.
1. 40.78.CLDV CENTURY        231. 6.RACS    1. 15.9 22.5 18.3  55. 1.023 18.2 1.004    -0. -0.
1. 40.80.CLDV CENTURY        231. 6.RACS    7. 19.0 26.0 21.6  61. 1.181 18.1 1.194 3500. -0.
1. 40.81.CLDV CENTURY        231. 6.RACS    2. 20.0 29.0 23.3  63. 1.118 18.5 1.259    -0. -0.
1. 40.78.CLDV CUTLASS        231. 6.RACS    1. 15.9 22.5 18.3  55. 1.661 13.5 1.356    -0. -0.
1. 40.80.CLDV CUTLASS        231. 6.RACS    7. 19.0 26.0 21.6  53. 1.134 18.8 1.154 3500. -0.
1. 40.81.CLDV CUTLASS        231. 6.RACS    5. 20.0 29.0 23.3  60. 1.157 19.4 1.200    -0. -0.
1. 40.80.CLDV DELTA 88       231. 6.RACS    1. 19.0 27.0 21.9  75. 1.139 27.2 0.805    -0. -0.
1. 40.80.CLDV FIREBIRD       231. 6.RACS    1. 19.0 26.0 21.6  82. 1.289 17.4 1.240    -0. -0.
1. 40.80.CLDV IMPALA         231. 6.RACS    4. 19.0 27.0 21.9  53. 1.089 18.2 1.201    -0. -0.

1. 40.80.CLDV LE MANS        231. 6.RACS    4. 19.0 26.0 21.6  38. 1.115 19.4 1.113    -0. -0.
1. 40.80.CLDV LESABRE        231. 6.RACS    6. 19.0 27.0 21.9  42. 1.155 18.2 1.206 4000. -0.
1. 40.78.CLDV MALIBU         231. 6.RACS    3. 15.9 22.7 18.4  70. 1.323 15.8 1.160    -0. -0.
1. 40.80.CLDV MALIBU         231. 6.RACS    3. 19.0 26.0 21.6  43. 1.198 18.1 1.193    -0. -0.
1. 40.81.CLDV MALIBU         231. 6.RACS    4. 20.0 29.0 23.3  63. 1.201 18.6 1.248    -0. -0.
1. 40.80.CLDV MONTE CARLO    231. 6.RACS    6. 18.8 25.8 21.4  63. 1.262 16.8 1.278 3500. -0.
1. 40.81.CLDV MONTE CARLO    231. 6.RACS    1. 20.0 29.0 23.3  75. 1.193 20.0 1.164    -0. -0.
1. 40.78.CLDV MONZA          231. 6.RACS    1. 16.0 23.0 18.5 100. 1.560 14.1 1.318    -0. -0.
1. 40.79.CLDV MONZA          231. 6.RACS    1. 16.0 22.0 18.2  25. 0.987 20.3 0.897    -0. -0.
1. 40.79.CLDV REGAL          231. 6.RACS    1. 18.0 25.0 20.6  50. 1.271 16.7 1.235    -0. -0.
```

```
1. 40.80.CLDV REGAL          231. 6.RACS   7. 19.0 26.0 21.6  72. 1.227 18.7 1.161 3500. -0.
1. 40.81.CLDV REGAL          231. 6.RACS   2. 20.0 29.0 23.3  75. 1.179 16.8 1.385   -0. -0.
1. 40.75.CLDV SKYHAWK        231. 6.RACS   8. 16.7 23.1 19.1  55. 1.165 17.3 1.105   -0. -0.
1. 40.76.CLDV SKYHAWK        231. 6.RACS   9. 18.0 24.4 20.4  55. 1.150 18.2 1.122   -0. -0.
1. 40.80.CLDV SKYHAWK        231. 6.RACS   2. 19.0 26.0 21.6  49. 1.228 17.4 1.241 3500. -0.
1. 40.76.CLDV SKYLARK        231. 6.RACS   5. 16.3 22.3 18.6  55. 1.146 16.3 1.138   -0. -0.
1. 40.75.CLDV STARFIRE       231. 6.RACS   6. 16.7 23.1 19.1  55. 1.100 19.9 0.959   -0. -0.
1. 40.76.CLDV STARFIRE       231. 6.RACS   4. 18.0 24.4 20.4  55. 1.222 18.8 1.084   -0. -0.
1. 40.76.CLDV SUNBIRD        231. 6.RACS   2. 18.0 24.4 20.4  55. 1.128 18.1 1.122   -0. -0.
1. 40.78.CLDV MALIBU         231. 6.RACW   1. 15.9 22.5 18.3  55. 1.252 13.8 1.324   -0. -0.

1. 40.80.CLDV MALIBU W       231. 6.RACW   2. 19.0 26.0 21.6  53. 1.206 18.6 1.161   -0. -0.
1. 40.76.CLDV SKYHAWK        231. 6.RMCS   7. 16.6 25.8 19.8  55. 1.061 19.1 1.033   -0. -0.
1. 40.76.CLDV SUNBIRD        231. 6.RMCS   1. 16.6 25.8 19.8  55. 1.041 16.9 1.171   -0. -0.
1. 40.75.CLDV CAMARO         250. 6.RACS   1. 15.1 19.8 16.9  55. 1.028 17.4 0.975   -0. -0.
1. 40.75.CLDV FIREBIRD       250. 6.RACS   1. 15.1 19.8 16.9  55. 1.254 14.8 1.142   -0. -0.
1. 40.75.CLDV NOVA           250. 6.RACS   4. 15.1 19.8 16.9  55. 1.179 14.8 1.143   -0. -0.
1. 40.76.CLDV NOVA           250. 6.RACS   1. 14.8 20.9 17.1  55. 1.304 13.0 1.313   -0. -0.
1. 40.75.CLDV VENTURA        250. 6.RACS   1. 15.1 19.8 16.9  55. 1.051 16.1 1.048   -0. -0.
1. 40.81.CLDV ELECTRA        252. 6.RACS   1. 17.0 26.0 20.1  75. 1.031 18.0 1.116   -0. -0.
1. 40.78.CLDV CUTLASS        260. 8.RACS   9. 17.2 24.6 19.9  52. 1.057 16.9 1.174   -0. -0.

1. 40.75.CLDV OMEGA          260. 8.RACS   1. 13.0 17.0 14.5  55. 1.110 14.0 1.039   -0. -0.
1. 40.76.CLDV OMEGA          260. 8.RACS   1. 14.2 19.6 16.2  55. 1.055 17.2 0.942   -0. -0.
1. 40.76.CLDV VENTURA        260. 8.RACS   2. 14.2 19.6 16.2  55. 1.547 11.5 1.408   -0. -0.
1. 40.79.CLDV CAMARO         305. 8.RACS   1. 13.0 19.0 15.1  50. 0.969 16.5 0.918   -0. -0.
1. 40.80.CLDV CAMARO         305. 8.RACS   2. 14.0 19.0 15.9  38. 1.090 15.0 1.058   -0. -0.
1. 40.80.CLDV CENTURY        305. 8.RACS   2. 15.0 21.0 17.2  71. 1.167 12.5 1.372   -0. -0.
1. 40.80.CLDV CORVETTE       305. 8.RACS   2. 13.0 20.0 15.4  30. 1.045 18.4 0.838   -0. -0.
1. 40.78.CLDV CUTLASS        305. 8.RACS   2. 14.2 20.8 16.6  55. 1.122 14.4 1.150   -0. -0.
1. 40.79.CLDV CUTLASS        305. 8.RACS   1. 16.0 21.0 17.9  75. 1.255 14.4 1.245   -0. -0.
1. 40.80.CLDV CUTLASS        305. 8.RACS   6. 14.0 19.8 16.1  66. 1.168 14.1 1.145 3500. -0.

1. 40.81.CLDV DELTA 88       305. 8.RACS   1. 17.0 28.0 20.6  75. 1.331 17.2 1.199   -0. -0.
1. 40.80.CLDV FIREBIRD       305. 8.RACS   1. 14.0 19.0 15.9  50. 1.087 10.7 1.484 4000. -0.
1. 40.78.CLDV GRAND PRIX     305. 8.RACS   2. 14.2 20.8 16.6  55. 1.039 16.6 0.998   -0. -0.
1. 40.80.CLDV GRAND PRIX     305. 8.RACS   1. 15.0 21.0 17.2   6. 0.943 21.6 0.797   -0. -0.
1. 40.78.CLDV IMPALA         305. 8.RACS   2. 13.4 19.2 15.5  55. 1.006 15.2 1.022   -0. -0.
1. 40.80.CLDV IMPALA         305. 8.RACS   1. 14.0 19.0 15.9 100. 1.326 17.8 0.890 4000. -0.
1. 40.81.CLDV IMPALA         305. 8.RACS   2. 16.0 26.0 19.3  75. 1.297 14.2 1.363   -0. -0.
1. 40.80.CLDV LE MANS        305. 8.RACS   2. 15.0 21.0 17.2  53. 1.118 15.9 1.082   -0. -0.
1. 40.79.CLDV MALIBU         305. 8.RACS   1. 16.0 21.0 17.9  75. 1.189 11.3 1.587   -0. -0.
1. 40.80.CLDV MALIBU         305. 8.RACS   2. 15.0 21.0 17.2  63. 1.286 15.2 1.127   -0. -0.

1. 40.81.CLDV MALIBU         305. 8.RACS   1. 18.0 25.0 20.6  50. 0.924 17.3 1.193   -0. -0.
1. 40.78.CLDV MONTE CARLO    305. 8.RACS   1. 14.0 21.0 16.5  75. 1.395  9.8 1.677   -0. -0.
1. 40.80.CLDV MONTE CARLO    305. 8.RACS   1. 15.0 21.0 17.2 100. 1.710 11.4 1.507   -0. -0.
1. 40.76.CLDV NOVA           305. 8.RACS   1. 13.1 18.0 14.9  55. 1.363 14.2 1.050   -0. -0.
1. 40.78.CLDV REGAL          305. 8.RACS   2. 14.1 20.9 16.5  40. 1.093 13.8 1.194   -0. -0.
1. 40.80.CLDV REGAL          305. 8.RACS   1. 15.0 21.0 17.2  25. 1.057 19.4 0.886   -0. -0.
1. 40.81.CLDV 98             305. 8.RACS   1. 17.0 28.0 20.6  55. 1.136 18.6 1.110   -0. -0.
1. 40.78.CLDV CUTLASS W      305. 8.RACW   1. 13.4 19.2 15.5  55. 0.994 14.6 1.065   -0. -0.
1. 40.80.CLDV CUTLASS W      305. 8.RACW   1. 14.0 19.0 15.9  26. 1.139 14.2 1.116   -0. -0.
1. 40.78.CLDV MALIBU         305. 8.RACW   5. 13.4 19.2 15.5  55. 1.139 13.2 1.172   -0. -0.

1. 40.80.CLDV RIVIERA        350. 8.FACS   4  15.0 22.0 17.5  31. 1.064 15.7 1.115   -0. -0.
1. 40.80.CLDV ELDORADO       350. 8.FAIS   8. 14.0 23.0 17.0  61. 1.234 13.4 1.262 4000. -0.
1. 40.80.CLDV SEVILLE        350. 8.FAIS  13. 14.0 23.0 17.0  66. 1.239 14.1 1.203 4500. -0.
1. 40.75.CLDV CAMARO         350. 8.RACS   3. 13.6 18.6 15.5  55. 1.212 13.2 1.167   -0. -0.
1. 40.76.CLDV CAMARO         350. 8.RACS   3. 13.2 16.0 14.3  55. 1.295 11.1 1.291   -0. -0.
1. 40.75.CLDV CENTURY        350. 8.RACS   1. 13.2 19.6 15.5  55. 1.321 12.9 1.201   -0. -0.
1. 40.76.CLDV CUTLASS        350. 8.RACS   2. 12.6 18.7 14.7  55. 1.165 12.1 1.221   -0. -0.
1. 40.78.CLDV DELTA 88       350. 8.RACS  10. 14.7 21.8 17.2  55. 1.181 13.7 1.250   -0. -0.
1. 40.80.CLDV DELTA 88       350. 8.RACS   3. 15.0 22.0 17.5  62. 1.267 13.4 1.314   -0. -0.
1. 40.78.CLDV ELECTRA        350. 8.RACS   1. 13.8 20.3 16.1  55. 1.338 12.7 1.272   -0. -0.
```

```
1. 40.80.CLDV ELECTRA          350. 8.RACS     1. 15.0 21.0 17.2 100. 1.369 15.3 1.126   -0. -0.
1. 40.75.CLDV FIREBIRD         350. 8.RACS     5. 12.5 17.1 14.2  55. 1.086 11.8 1.205   -0. -0.
1. 40.76.CLDV GRAND PRIX       350. 8.RACS     1. 13.1 17.5 14.8  55. 1.402  9.8 1.497   -0. -0.
1. 40.76.CLDV IMPALA           350. 8.RACS     2. 10.8 16.0 12.7  55. 1.526 12.3 1.036   -0. -0.
1. 40.78.CLDV IMPALA           350. 8.RACS     2. 13.7 18.8 15.6  55. 1.042 14.3 1.085   -0. -0.
1. 40.75.CLDV LE MANS          350. 8.RACS     1. 10.3 13.3 11.5  55. 1.110 13.4 0.856   -0. -0.
1. 40.76.CLDV LE MANS          350. 8.RACS     1. 13.1 17.5 14.8  55. 1.219 13.7 1.074   -0. -0.
1. 40.75.CLDV LESABRE          350. 8.RACS     1. 11.8 15.4 13.2  55. 1.383 12.6 1.047   -0. -0.
1. 40.78.CLDV LESABRE          350. 8.RACS     3. 14.3 21.1 16.7  55. 1.129 14.2 1.173   -0. -0.
1. 40.75.CLDV MONTE CARLO      350. 8.RACS     3. 11.8 15.7 13.3  55. 1.352 12.1 1.103   -0. -0.

1. 40.76.CLDV MONTE CARLO      350. 8.RACS     6. 12.7 18.2 14.7  55. 1.160 12.0 1.219   -0. -0.
1. 40.75.CLDV NOVA             350. 8.RACS     3. 13.6 18.6 15.5  55. 1.088 13.7 1.132   -0. -0.
1. 40.75.CLDV OMEGA            350. 8.RACS     9. 13.5 17.8 15.2  55. 1.253 13.1 1.159   -0. -0.
1. 40.75.CLDV REGAL            350. 8.RACS     1. 13.2 19.6 15.5  55. 1.265 10.9 1.427   -0. -0.
1. 40.76.CLDV SKYLARK          350. 8.RACS     1. 13.6 19.8 15.8  55. 1.320 13.8 1.146   -0. -0.
1. 40.75.CLDV VENTURA          350. 8.RACS     2. 13.5 17.8 15.2  55. 1.127 12.4 1.220   -0. -0.
1. 40.78.CLDV 98               350. 8.RACS     2. 13.8 20.3 16.1  55. 1.047 14.3 1.124   -0. -0.
1. 40.80.CLDV 98               350. 8.RACS     3. 15.0 21.0 17.2  41. 1.104 16.6 1.037   -0. -0.
1. 40.80.CLDV CUST CRUISER W   350. 8.RACW     1. 15.0 20.0 16.9  36. 1.215 15.8 1.067   -0. -0.
1. 40.78.CLDV IMPALA W         350. 8.RACW     1. 12.3 16.8 14.0  55. 1.290 12.8 1.091   -0. -0.

1. 40.76.CLDV SEVILLE          350. 8.RAIS    15. 12.7 18.9 14.9  55. 1.140 12.1 1.230   -0. -0.
1. 40.80.CLDV DEVILLE          368. 8.RACS    34. 14.0 21.0 16.5  54. 1.221 13.6 1.213 4500. -0.
1. 40.80.CLDV FLEETWOOD        368. 8.RACS     1. 14.0 21.0 16.5  50. 1.087 15.1 1.089 4500. -0.
1. 40.75.CLDV FIREBIRD         400. 8.RACS     1. 11.9 15.7 13.3  55. 1.311 12.9 1.036   -0. -0.
1. 40.76.CLDV FIREBIRD         400. 8.RACS     1. 14.5 19.5 16.4  55. 1.189 14.3 1.147   -0. -0.
1. 40.75.CLDV GRAND PRIX       400. 8.RACS     2. 11.1 15.3 12.6  55. 1.048 13.7 0.917   -0. -0.
1. 40.76.CLDV GRAND PRIX       400. 8.RACS     1. 13.3 18.1 15.1  55. 1.214 14.3 1.058   -0. -0.
1. 40.76.CLDV IMPALA           400. 8.RACS     2. 11.1 15.0 12.5  55. 1.060 10.9 1.151   -0. -0.
1. 40.75.CLDV LE MANS          400. 8.RACS     1. 11.9 15.7 13.3  55. 1.289 10.6 1.261   -0. -0.
1. 40.75.CLDV IMPALA           400. 8.RACW     1.  9.8 12.9 11.0  55. 1.269 12.5 0.880   -0. -0.

1. 40.78.CLDV ELECTRA          403. 8.RACS     3. 13.4 19.4 15.5  55. 1.138 12.9 1.206   -0. -0.
1. 40.78.CLDV RIVIERA          403. 8.RACS     2. 13.4 19.4 15.5  55. 1.023 12.6 1.235   -0. -0.
1. 40.78.CLDV 98               403. 8.RACS     2. 13.4 19.4 15.5  55. 1.007 14.0 1.109   -0. -0.
1. 40.79.CLDV 98               403. 8.RACS     1. 14.0 19.0 15.9  75. 1.379 12.3 1.289   -0. -0.
1. 40.78.CLDV CATALINA W       403. 8.RACW     1. 13.4 19.4 15.5  55. 0.917 14.9 1.041   -0. -0.
1. 40.78.CLDV CUST CRUISER W   403. 8.RACW     1. 13.4 19.4 15.5  55. 0.972 12.5 1.244   -0. -0.
1. 40.78.CLDV ESTATE W         403. 8.RACW     3. 13.4 19.4 15.5  55. 0.986 14.4 1.073   -0. -0.
1. 40.78.CLDV DEVILLE          425. 8.RACS     3. 11.0 15.8 12.8  55. 1.211 13.1 0.976   -0. -0.
1. 40.78.CLDV FLEETWOOD        425. 8.RACS     1. 11.0 15.8 12.8  55. 1.583 14.5 0.878   -0. -0.
1. 40.75.CLDV TORONADO         455. 8.FACS     1.  8.5 12.1  9.8  55. 1.033  6.4 1.544   -0. -0.

1. 40.76.CLDV TORONADO         455. 8.FACS     1. 10.0 14.8 11.7  55. 1.305 10.0 1.176   -0. -0.
1. 40.75.CLDV ELECTRA          455. 8.RACS     5.  9.8 13.1 11.1  55. 1.088 11.9 0.936   -0. -0.
1. 40.75.CLDV RIVIERA          455. 8.RACS     3.  9.8 13.0 11.0  55. 1.315 10.6 1.038   -0. -0.
1. 40.76.CLDV RIVIERA          455. 8.RACS     2. 11.3 16.2 13.1  55. 1.438  9.5 1.373   -0. -0.
1. 40.76.CLDV 98               455. 8.RACS     1. 10.6 15.4 12.4  55. 0.918 11.1 1.115   -0. -0.
1. 40.75.CLDV ELDORADO         500. 8.FACS    11. 10.5 14.8 12.1  55. 1.150 11.5 1.055   -0. -0.
1. 40.76.CLDV ELDORADO         500. 8.FACS     5. 10.7 14.7 12.2  55. 1.305 10.9 1.122   -0. -0.
1. 40.75.CLDV DEVILLE          500. 8.RACS     7. 10.8 13.7 11.9  55. 1.134 10.0 1.187   -0. -0.
1. 40.76.CLDV FLEETWOOD        500. 8.RACS     1. 10.7 14.6 12.2  55. 1.266 11.6 1.045   -0. -0.
1. 40.80.FLDD ELDORADO         350. 8.FADS    13. 21.0 31.0 24.6  62. 1.194 20.7 1.184   -0. -0.

1. 40.80.FLDD SEVILLE          350. 8.FADS    21. 21.0 31.0 24.6  49. 1.167 19.8 1.240   -0. -0.
1. 40.79.FLDD TORONADO         350. 8.FADS     1. 21.0 29.0 24.0  55. 1.075 22.0 1.090 4000.  5.
1. 40.80.FLDD TORONADO         350. 8.FADS    27. 22.0 34.0 26.1  58. 1.212 21.7 1.203   -0. -0.
1. 40.80.FLDD BONNEVILLE       350. 8.RADS    21. 22.0 34.0 26.1  43. 1.052 24.7 1.058   -0. -0.
1. 40.79.FLDD CUTLASS          350. 8.RADS     3. 24.0 32.0 27.0  55. 1.076 21.2 1.274 3750.  5.
1. 40.80.FLDD CUTLASS          350. 8.RADS     9. 22.0 34.0 26.1  41. 1.099 23.7 1.099 3750.  5.
1. 40.78.FLDD DELTA 88         350. 8.RADS    19. 21.0 29.9 24.3  55. 0.994 21.2 1.147 4500.  6.
1. 40.79.FLDD DELTA 88         350. 8.RADS     6. 21.0 29.0 24.0  55. 1.075 22.6 1.061 4500.  6.
1. 40.80.FLDD DELTA 88         350. 8.RADS    33. 22.0 34.0 26.1  47  1.113 23.2 1.126 4500.  6.
1. 40.80.FLDD ELECTRA          350. 8.RADS     9. 21.0 31.0 24.6  37. 1.013 24.3 1.011   -0. -0.
```

```
1. 40.80.FLDD LESABRE          350. 8.RADS   13. 21.0 32.0 24.8  49. 1.097 23.5 1.058   -0.  -0.
1. 40.79.FLDD SEVILLE          350. 8.RADS    1. 21.0 29.0 24.0  55. 1.075 29.7 0.808 4500.   5.
1. 40.78.FLDD 98               350. 8.RADS   18. 21.0 29.9 24.3  55. 0.964 22.0 1.103 4500.   6.
1. 40.79.FLDD 98               350. 8.RADS    1. 21.0 29.0 24.0  55. 1.075 23.9 1.005 4500.   6.
1. 40.80.FLDD 98               350. 8.RADS   24. 21.0 31.0 24.6  42. 1.078 23.0 1.067   -0.  -0.
1. 40.80.FLDD BONNEVILLE W     350. 8.RADW    1. 21.0 31.0 24.6   0. 0.870 24.4 1.007   -0.  -0.
1. 40.78.FLDD CUST CRUISER W 350. 8.RADW    4. 19.1 26.8 22.0  55. 1.154 18.9 1.162 4500.   9.
1. 40.80.FLDD CUST CRUISER W 350. 8.RADW    5. 21.0 31.0 24.6  65. 1.343 18.3 1.344   -0.  -0.
1. 40.80.FLDD CUTLASS W        350. 8.RADW    6. 22.0 34.0 26.1  48. 1.009 22.1 1.184   -0.  -0.
1. 40.80.FLDD ESTATE W         350. 8.RADW    4. 21.0 31.0 24.6  55. 1.084 22.6 1.087   -0.  -0.

1. 40.80.FLDD IMPALA W         350. 8.RADW    5. 21.0 31.0 24.6  73. 1.223 20.0 1.226   -0.  -0.
1. 40.76.FLDV CHEVETTE          85. 4.RACS   27. 23.5 31.0 26.4  55. 1.240 21.1 1.249   -0.  -0.
1. 40.76.FLDV CHEVETTE          85. 4.RMCS   31. 27.4 39.3 31.7  54. 1.184 26.4 1.196 2250.  -0.
1. 40.76.FLDV CHEVETTE          98. 4.RACS   30. 25.5 33.2 28.5  55. 1.229 20.9 1.367   -0.  -0.
1. 40.77.FLDV CHEVETTE          98. 4.RACS    1. 26.0 36.0 29.7  55. 1.097 19.0 1.564 2250.   2.
1. 40.78.FLDV CHEVETTE          98. 4.RACS   36. 24.1 32.1 27.1  56. 1.124 22.5 1.203 2250.   3.
1. 40.79.FLDV CHEVETTE          98. 4.RACS    2. 25.0 30.0 27.0  55. 1.077 21.4 1.263 2500.   3.
1. 40.80.FLDV CHEVETTE          98. 4.RACS   26. 25.0 30.0 27.0  53. 1.218 22.6 1.196 2500.   3.
1. 40.81.FLDV CHEVETTE          98. 4.RACS    3. 26.0 33.0 28.7  83. 1.119 24.2 1.189   -0.  -0.
1. 40.76.FLDV CHEVETTE          98. 4.RMCS   30. 29.5 39.2 33.2  55. 1.115 26.2 1.267   -0.  -0.

1. 40.77.FLDV CHEVETTE          98. 4.RMCS    1. 31.0 43.0 35.4  50. 0.915 24.6 1.441 2250.  -0.
1. 40.78.FLDV CHEVETTE          98. 4.RMCS   34. 30.3 40.1 34.0  55. 1.097 25.5 1.336 2375.   3.
1. 40.79.FLDV CHEVETTE          98. 4.RMCS    3. 29.0 40.0 33.1  50. 1.018 27.4 1.208 2375.  -0.
1. 40.80.FLDV CHEVETTE          98. 4.RMCS   36. 26.0 36.0 29.7  54. 1.191 26.7 1.113 2500.  -0.
1. 40.81.FLDV CHEVETTE          98. 4.RMCS    9. 30.0 39.0 33.5  64. 1.119 28.4 1.178   -0.  -0.
1. 40.75.FLDV ASTRE            140. 4.RACS   17. 18.9 28.3 22.3  55. 1.161 18.8 1.184   -0.  -0.
1. 40.76.FLDV ASTRE            140. 4.RACS   24. 19.4 28.1 22.5  55. 1.264 17.9 1.256   -0.  -0.
1. 40.75.FLDV MONZA            140. 4.RACS    4. 21.0 27.6 23.5  55. 1.189 21.2 1.107   -0.  -0.
1. 40.76.FLDV MONZA            140. 4.RACS   18. 19.4 28.1 22.5  55. 1.276 17.8 1.263   -0.  -0.
1. 40.76.FLDV SUNBIRD          140. 4.RACS    3. 19.6 28.3 22.7  55. 1.170 18.2 1.244   -0.  -0.

1. 40.75.FLDV VEGA             140. 4.RACS   30. 18.9 28.3 22.3  55. 1.198 20.2 1.101   -0.  -0.
1. 40.76.FLDV VEGA             140. 4.RACS   24. 19.4 28.1 22.5  55. 1.217 18.5 1.220 2750.   2.
1. 40.75.FLDV ASTRE W          140. 4.RACW   24. 19.0 28.3 22.3  55. 1.174 18.7 1.189   -0.  -0.
1. 40.76.FLDV ASTRE W          140. 4.RACW    8. 19.5 28.3 22.7  55. 1.128 19.2 1.179   -0.  -0.
1. 40.75.FLDV VEGA W           140. 4.RACW   11. 19.0 28.3 22.3  55. 1.145 20.5 1.083   -0.  -0.
1. 40.76.FLDV VEGA W           140. 4.RACW   25. 19.4 28.1 22.5  55. 1.232 17.6 1.280   -0.  -0.
1. 40.75.FLDV ASTRE            140. 4.RMCS   26. 20.6 30.7 24.2  55. 1.159 22.0 1.097   -0.  -0.
1. 40.76.FLDV ASTRE            140. 4.RMCS    7. 21.9 34.8 26.3  55. 1.121 22.8 1.151   -0.  -0.
1. 40.75.FLDV MONZA            140. 4.RMCS    4. 19.0 32.2 23.3  55. 1.087 22.9 1.017   -0.  -0.
1. 40.76.FLDV MONZA            140. 4.RMCS   30. 21.5 33.8 25.7  55. 1.196 21.4 1.205   -0.  -0.

1. 40.76.FLDV SUNBIRD          140. 4.RMCS    6. 21.6 34.0 25.8  55. 1.108 22.5 1.150   -0.  -0.
1. 40.75.FLDV VEGA             140. 4.RMCS   25. 20.6 30.7 24.2  55. 1.234 22.8 1.063   -0.  -0.
1. 40.76.FLDV VEGA             140. 4.RMCS   21. 21.7 34.3 26.0  55. 1.092 24.0 1.081   -0.  -0.
1. 40.75.FLDV ASTRE W          140. 4.RMCW    5. 20.6 30.7 24.2  55. 1.117 25.8 0.936   -0.  -0.
1. 40.76.FLDV ASTRE W          140. 4.RMCW   10. 21.6 34.0 25.8  55. 1.102 21.7 1.189   -0.  -0.
1. 40.75.FLDV VEGA W           140. 4.RMCW   14. 20.6 30.7 24.2  55. 1.152 22.7 1.065   -0.  -0.
1. 40.76.FLDV VEGA W           140. 4.RMCW   15. 21.5 33.8 25.7  55. 1.136 21.5 1.197   -0.  -0.
1. 40.80.FLDV CITATION         151. 4.FACS   29. 22.0 35.0 26.4  55. 1.210 22.1 1.197 2750.   5.
1. 40.81.FLDV CITATION         151. 4.FACS    5. 24.0 36.0 28.2  85. 1.328 21.7 1.304   -0.  -0.
1. 40.80.FLDV OMEGA            151. 4.FACS   32. 22.0 35.0 26.4  58. 1.222 21.6 1.220 3000.  -0.

1. 40.81.FLDV OMEGA            151. 4.FACS    1. 24.0 36.0 28.2 100. 1.087 24.9 1.132   -0.  -0.
1. 40.80.FLDV PHOENIX          151. 4.FACS   31. 21.0 33.0 25.1  56. 1.250 20.9 1.204   -0.  -0.
1. 40.81.FLDV PHOENIX          151. 4.FACS    2. 23.0 34.4 27.0  25. 0.935 23.6 1.152   -0.  -0.
1. 40.80.FLDV SKYLARK          151. 4.FACS   34. 22.0 34.0 26.1  53. 1.213 21.9 1.194 3250.   4.
1. 40.81.FLDV SKYLARK          151. 4.FACS    3. 24.0 36.0 28.2  75. 1.205 21.9 1.293   -0.  -0.
1. 40.80.FLDV CITATION         151. 4.FMCS   21. 23.9 37.8 28.7  50. 1.179 26.1 1.096 2750.   5.
1. 40.81.FLDV CITATION         151. 4.FMCS    1. 22.0 35.0 26.4  75. 1.147 22.2 1.192   -0.  -0.
1. 40.80.FLDV OMEGA            151. 4.FMCS   16. 24.0 38.0 28.8  50. 1.145 27.9 1.029   -0.  -0.
1. 40.81.FLDV OMEGA            151. 4.FMCS    1. 22.0 35.0 26.4  75. 1.117 24.8 1.064   -0.  -0.
1. 40.80.FLDV PHOENIX          151. 4.FMCS   22. 24.0 37.0 28.5  48. 1.121 25.5 1.117   -0.  -0.
```

```
1. 40.81.FLDV PHOENIX          151. 4.FMCS    2. 22.0 35.0 26.4  75. 1.268 23.9 1.107   -0. -0.
1. 40.80.FLDV SKYLARK          151. 4.FMCS   10. 24.0 38.0 28.8  48. 1.157 26.5 1.087   -0. -0.
1. 40.81.FLDV SKYLARK          151. 4.FMCS    2. 22.0 35.0 26.4  50. 0.991 24.4 1.084   -0. -0.
1. 40.77.FLDV ASTRE            151. 4.RACS    1. 24.0 32.0 27.0  55. 1.076 19.9 1.359 3000.  2.
1. 40.78.FLDV MONZA            151. 4.RACS    1. 23.0 31.0 26.0  75. 1.095 23.7 1.098   -0. -0.
1. 40.79.FLDV MONZA            151. 4.RACS    1. 23.0 31.0 26.0  75. 1.255 18.1 1.435 3000. -0.
1. 40.80.FLDV MONZA            151. 4.RACS   17. 24.0 32.0 27.0  69. 1.270 19.3 1.402   -0. -0.
1. 40.80.FLDV STARFIRE         151. 4.RACS    5. 24.0 32.0 27.0  53. 1.297 19.2 1.410   -0. -0.
1. 40.77.FLDV SUNBIRD          151. 4.RACS    1. 24.0 32.0 27.0  55. 1.069 20.7 1.306 3000.  2.
1. 40.79.FLDV SUNBIRD          151. 4.RACS    1. 22.0 30.0 25.0  50. 1.039 27.3 0.915 3000. -0.

1. 40.80.FLDV SUNBIRD          151. 4.RACS   28. 24.0 32.0 27.0  53. 1.236 20.0 1.355   -0. -0.
1. 40.77.FLDV ASTRE            151. 4.RACW    3. 24.0 32.0 27.0  55. 1.062 19.3 1.404 3000.  7.
1. 40.78.FLDV MONZA            151. 4.RMCS    1. 24.0 34.0 27.7  50. 0.944 16.5 1.680 3000. -0.
1. 40.80.FLDV MONZA            151. 4.RMCS   26. 22.0 35.0 26.4  53. 1.131 22.7 1.163   -0. -0.
1. 40.80.FLDV STARFIRE         151. 4.RMCS    3. 22.0 35.0 26.4  56. 1.170 23.8 1.111   -0. -0.
1. 40.78.FLDV SUNBIRD          151. 4.RMCS    1. 24.0 34.0 27.7  50. 0.975 23.0 1.204 3000. -0.
1. 40.80.FLDV SUNBIRD          151. 4.RMCS   20. 22.0 35.0 26.4  43. 1.122 23.6 1.123   -0. -0.
1. 40.80.FLDV CITATION         173. 6.FACS   37. 20.0 30.0 23.5  55. 1.254 18.7 1.256 3000. -0.
1. 40.81.FLDV CITATION         173. 6.FACS    5. 21.0 31.0 24.6  90. 1.297 19.0 1.289   -0. -0.
1. 40.80.FLDV OMEGA            173. 6.FACS   30. 20.0 30.0 23.5  55. 1.264 19.1 1.229   -0. -0.

1. 40.81.FLDV OMEGA            173. 6.FACS    4. 21.0 31.0 24.6  56. 1.111 22.3 1.102   -0. -0.
1. 40.80.FLDV PHOENIX          173. 6.FACS   30. 20.0 30.0 23.5  55. 1.234 18.6 1.267   -0. -0.
1. 40.81.FLDV PHOENIX          173. 6.FACS    3. 21.0 31.0 24.6  83. 1.231 19.9 1.231   -0. -0.
1. 40.80.FLDV SKYLARK          173. 6.FACS   43. 20.0 30.0 23.5  55. 1.209 19.4 1.217 3500.  4.
1. 40.81.FLDV SKYLARK          173. 6.FACS    3. 21.0 31.0 24.6  58. 1.083 19.9 1.237   -0. -0.
1. 40.80.FLDV CITATION         173. 6.FMCS   22. 20.0 34.0 24.5  54. 1.198 21.6 1.139   -0. -0.
1. 40.81.FLDV CITATION         173. 6.FMCS    2. 21.0 34.0 25.4  63. 1.038 20.8 1.214   -0. -0.
1. 40.80.FLDV OMEGA            173. 6.FMCS    4. 20.0 34.0 24.5  37. 1.137 23.4 1.047   -0. -0.
1. 40.80.FLDV PHOENIX          173. 6.FMCS    4. 20.0 34.0 24.5  44. 1.064 23.8 1.027   -0. -0.
1. 40.80.FLDV SKYLARK          173. 6.FMCS    2. 20.0 33.0 24.3  88. 1.425 18.4 1.325   -0. -0.

1. 40.78.FLDV CENTURY          196. 6.RACS   18. 18.0 25.7 20.8  55. 1.031 17.7 1.172   -0. -0.
1. 40.78.FLDV MONZA            196. 6.RACS    1. 18.0 26.0 20.9 100. 1.166 17.6 1.184 3000. -0.
1. 40.79.FLDV MONZA            196. 6.RACS    3. 20.9 27.0 23.2  60. 1.196 15.8 1.469 3500. -0.
1. 40.78.FLDV REGAL            196. 6.RACS    1. 18.0 25.7 20.8  55. 1.068 18.3 1.137   -0. -0.
1. 40.78.FLDV MONZA            196. 6.RMCS    1. 19.0 33.0 23.5  75. 1.221 14.1 1.661 3000. -0.
1. 40.78.FLDV MALIBU           200. 6.RACS   34. 18.6 24.9 21.0  55. 1.154 17.3 1.217 4000.  5.
1. 40.79.FLDV MALIBU           200. 6.RACS    5. 18.0 24.0 20.3  73. 1.218 16.1 1.262 3800.  5.
1. 40.78.FLDV MONTE CARLO      200. 6.RACS    1. 19.0 27.0 21.9  50. 0.998 18.7 1.170   -0. -0.
1. 40.78.FLDV MALIBU           200. 6.RACW    2. 18.6 24.9 21.0  55. 0.924 20.5 1.027   -0. -0.
1. 40.78.FLDV MALIBU W         200. 6.RACW   19. 18.6 24.9 21.0  55. 0.970 18.7 1.123   -0. -0.

1. 40.78.FLDV MALIBU           200. 6.RMCS    1. 21.2 29.3 24.2  55. 1.068 22.6 1.070   -0. -0.
1. 40.78.FLDV MALIBU W         200. 6.RMCW    3. 21.2 29.3 24.2  55. 1.219 19.8 1.223   -0. -0.
1. 40.80.FLDV CAMARO           229. 6.RACS   14. 19.0 26.0 21.6  47. 1.183 16.2 1.337   -0. -0.
1. 40.80.FLDV IMPALA           229. 6.RACS   31. 18.0 26.0 20.9  57. 1.222 16.9 1.235   -0. -0.
1. 40.78.FLDV LE MANS          229. 6.RACS   25. 18.8 26.0 21.4  56. 1.106 18.1 1.189 3500. -0.
1. 40.80.FLDV LE MANS          229. 6.RACS   31. 19.0 26.0 21.6  58. 1.240 16.7 1.291   -0. -0.
1. 40.81.FLDV LE MANS          229. 6.RACS    1. 21.0 30.0 24.3  25. 1.209 18.8 1.288   -0. -0.
1. 40.80.FLDV MALIBU           229. 6.RACS   37. 19.0 26.0 21.6  48. 1.209 17.3 1.249 3607.  5.
1. 40.81.FLDV MALIBU           229. 6.RACS    5. 19.0 26.0 21.6  55. 1.006 18.1 1.197   -0. -0.
1. 40.78.FLDV MONTE CARLO      229. 6.RACS    2. 19.0 27.0 21.9  50. 0.926 18.1 1.207 3500. -0.

1. 40.80.FLDV MONTE CARLO      229. 6.RACS   32. 18.7 25.7 21.3  44. 1.190 17.0 1.253   -0. -0.
1. 40.81.FLDV MONTE CARLO      229. 6.RACS    2. 19.0 26.0 21.6  50. 1.021 16.9 1.281   -0. -0.
1. 40.78.FLDV LE MANS W        229. 6.RACW   12. 18.8 26.0 21.4  55. 1.060 18.6 1.151   -0. -0.
1. 40.80.FLDV LE MANS W        229. 6.RACW   24. 19.0 26.0 21.6  45. 1.149 17.8 1.216   -0. -0.
1. 40.80.FLDV MALIBU W         229. 6.RACW   23. 19.0 26.0 21.6  42. 1.178 17.1 1.261   -0. -0.
1. 40.80.FLDV CAMARO           229. 6.RMCS    3. 20.0 26.0 22.3  51. 1.048 19.4 1.150   -0. -0.
1. 40.78.FLDV LE MANS          229. 6.RMCS    1. 16.0 28.0 19.8  50. 1.201 22.4 0.883   -0. -0.
1. 40.80.FLDV LE MANS          229. 6.RMCS    2. 20.0 26.0 22.3  15. 0.978 22.0 1.014   -0. -0.
1. 40.80.FLDV MALIBU           229. 6.RMCS    3. 20.0 26.0 22.3  83. 1.279 18.2 1.225 3500. -0.
1. 40.80.FLDV MALIBU W         229. 6.RMCW    2. 20.0 26.0 22.3  56. 1.313 14.2 1.578   -0. -0.
```

```
1. 40.80.FLDV RIVIERA         231. 6.FACS   4. 16.0 23.0 18.5  51. 1.319 14.1 1.318   -0. -0.
1. 40.80.FLDV BONNEVILLE      231. 6.RACS  20. 18.0 24.0 20.3  56. 1.251 16.0 1.263   -0. -0.
1. 40.77.FLDV CATALINA        231. 6.RACS   1. 17.0 25.0 19.9  55. 1.031 16.3 1.218 4000.  6.
1. 40.78.FLDV CATALINA        231. 6.RACS   5. 17.0 25.0 19.9  55. 1.074 18.5 1.073 4000.  6.
1. 40.81.FLDV CATALINA        231. 6.RACS   1. 19.0 28.0 22.2  75. 1.082 17.5 1.270   -0. -0.
1. 40.75.FLDV CENTURY         231. 6.RACS  19. 15.6 23.9 18.5  55. 1.167 15.6 1.181   -0. -0.
1. 40.76.FLDV CENTURY         231. 6.RACS   3. 17.0 24.8 19.8  55. 1.039 16.7 1.185   -0. -0.
1. 40.77.FLDV CENTURY         231. 6.RACS   3. 17.0 25.0 19.9  55. 1.031 15.7 1.264 4000.  5.
1. 40.78.FLDV CENTURY         231. 6.RACS  37. 18.6 26.0 21.3  54. 1.115 17.1 1.239 3929.  5.
1. 40.80.FLDV CENTURY         231. 6.RACS  34. 20.0 27.0 22.6  56. 1.188 17.5 1.300 3500. -0.

1. 40.81.FLDV CENTURY         231. 6.RACS   2. 21.0 30.0 24.3  63. 1.244 18.9 1.287   -0. -0.
1. 40.77.FLDV CUTLASS         231. 6.RACS   5. 17.0 25.0 19.9  49. 0.994 16.9 1.175 4000.  5.
1. 40.78.FLDV CUTLASS         231. 6.RACS  33. 18.8 26.1 21.4  55. 1.163 16.8 1.286 4000.  5.
1. 40.79.FLDV CUTLASS         231. 6.RACS   2. 19.0 25.0 21.3  88. 1.153 15.6 1.368 3500. -0.
1. 40.80.FLDV CUTLASS         231. 6.RACS  38. 20.0 27.0 22.6  60. 1.225 17.2 1.316 3563.  5.
1. 40.81.FLDV CUTLASS         231. 6.RACS   9. 21.0 30.0 24.3  67. 1.140 18.6 1.309   -0. -0.
1. 40.77.FLDV DELTA 88        231. 6.RACS   2. 17.0 25.0 19.9  55. 1.039 15.9 1.245 4000.  6.
1. 40.78.FLDV DELTA 88        231. 6.RACS   1. 17.0 25.0 19.9 100. 1.234 12.3 1.612 4000. -0.
1. 40.79.FLDV DELTA 88        231. 6.RACS   1. 18.0 27.0 21.2  55. 1.074 15.0 1.412 4000.  6.
1. 40.80.FLDV DELTA 88        231. 6.RACS   3. 18.0 24.0 20.3  46. 1.125 16.2 1.252   -0. -0.

1. 40.77.FLDV FIREBIRD        231. 6.RACS   1. 17.0 25.0 19.9  50. 1.004 18.2 1.092 4000. -0.
1. 40.80.FLDV FIREBIRD        231. 6.RACS  19. 20.0 27.0 22.6  63. 1.223 16.9 1.342   -0. -0.
1. 40.78.FLDV GRAND PRIX      231. 6.RACS   1. 18.8 26.0 21.4  55. 1.168 18.4 1.163   -0. -0.
1. 40.79.FLDV GRAND PRIX      231. 6.RACS   2. 19.0 25.0 21.3  65. 1.043 18.5 1.150 3500.  5.
1. 40.80.FLDV GRAND PRIX      231. 6.RACS  31. 20.0 27.0 22.6  56. 1.184 17.9 1.264 3500. -0.
1. 40.77.FLDV LESABRE         231. 6.RACS   3. 17.0 25.0 19.9  55. 1.036 16.2 1.230 4500.  6.
1. 40.78.FLDV LESABRE         231. 6.RACS  34. 16.3 23.5 18.9  55. 1.084 15.6 1.211 4500.  6.
1. 40.80.FLDV LESABRE         231. 6.RACS  12. 18.0 24.0 20.3  31. 1.114 16.8 1.210   -0. -0.
1. 40.80.FLDV MONZA           231. 6.RACS   9. 19.0 27.0 21.9  90. 1.430 16.1 1.360   -0. -0.
1. 40.77.FLDV OMEGA           231. 6.RACS   5. 19.0 26.0 21.6  64. 1.065 17.0 1.272 3500.  4.

1. 40.75.FLDV REGAL           231. 6.RACS   2. 15.6 23.9 18.5  55. 1.054 16.3 1.133   -0. -0.
1. 40.76.FLDV REGAL           231. 6.RACS  15. 17.0 24.8 19.8  55. 1.227 16.8 1.183 4000. -0.
1. 40.78.FLDV REGAL           231. 6.RACS  33. 18.4 26.0 21.2  55. 1.070 16.8 1.261 3500. -0.
1. 40.79.FLDV REGAL           231. 6.RACS   2. 17.9 24.5 20.4  75. 1.215 17.4 1.171 3500. -0.
1. 40.80.FLDV REGAL           231. 6.RACS  31. 20.0 27.0 22.6  52. 1.190 17.0 1.324   -0. -0.
1. 40.81.FLDV REGAL           231. 6.RACS   3. 21.0 30.0 24.3  58. 1.025 19.5 1.246   -0. -0.
1. 40.75.FLDV SKYHAWK         231. 6.RACS  31. 15.7 23.9 18.6  56. 1.129 18.7 0.996 3500. -0.
1. 40.76.FLDV SKYHAWK         231. 6.RACS  29. 17.9 26.2 20.9  55. 1.213 18.5 1.129   -0. -0.
1. 40.77.FLDV SKYHAWK         231. 6.RACS   1. 19.0 26.0 21.6  55. 1.042 16.9 1.279 3500.  2.
1. 40.80.FLDV SKYHAWK         231. 6.RACS  30. 19.0 27.0 21.9  46. 1.138 18.2 1.205   -0. -0.

1. 40.76.FLDV SKYLARK         231. 6.RACS  30. 17.0 24.8 19.8  55. 1.221 15.5 1.278   -0. -0.
1. 40.77.FLDV SKYLARK         231. 6.RACS   5. 18.0 25.0 20.6  58. 1.094 16.9 1.216 3600.  3.
1. 40.78.FLDV SKYLARK         231. 6.RACS   1. 18.0 26.0 20.9  55. 1.074 19.0 1.099 3500.  4.
1. 40.79.FLDV SKYLARK         231. 6.RACS   1. 19.0 25.0 21.3 100. 1.195 11.8 1.807 3500. -0.
1. 40.75.FLDV STARFIRE        231. 6.RACS  30. 20.3 25.3 22.3  55. 1.133 17.7 1.262   -0. -0.
1. 40.76.FLDV STARFIRE        231. 6.RACS  13. 17.9 26.2 20.9  55. 1.089 19.5 1.071   -0. -0.
1. 40.80.FLDV STARFIRE        231. 6.RACS  18. 19.0 26.0 21.6  48. 1.160 18.5 1.166   -0. -0.
1. 40.76.FLDV SUNBIRD         231. 6.RACS  12. 17.9 26.2 20.9  55. 1.181 17.7 1.177   -0. -0.
1. 40.77.FLDV SUNBIRD         231. 6.RACS   1. 19.0 26.0 21.6  25. 0.775 17.9 1.205 3500. -0.
1. 40.78.FLDV SUNBIRD         231. 6.RACS   3. 20.2 28.2 23.1  77. 1.061 17.4 1.342 3333.  3.

1. 40.79.FLDV SUNBIRD         231. 6.RACS   1. 20.0 25.0 22.0  75. 1.183 18.7 1.174   -0. -0.
1. 40.80.FLDV SUNBIRD         231. 6.RACS   1. 20.0 27.0 22.6  75. 1.271 15.7 1.446   -0. -0.
1. 40.77.FLDV VENTURA         231. 6.RACS   1. 18.0 26.0 20.9  55. 1.030 18.9 1.105 3500.  4.
1. 40.78.FLDV CENTURY         231. 6.RACW  25. 18.8 26.0 21.4  55. 1.094 17.9 1.200   -0. -0.
1. 40.80.FLDV CENTURY W       231. 6.RACW  12. 20.0 27.0 22.6  59. 1.275 17.6 1.286   -0. -0.
1. 40.78.FLDV CUTLASS W       231. 6.RACW  13. 18.8 26.0 21.4  55. 1.104 16.9 1.272   -0. -0.
1. 40.80.FLDV CUTLASS W       231. 6.RACW  12. 20.0 27.0 22.6  61. 1.281 16.7 1.359   -0. -0.
1. 40.78.FLDV CUTLASS         231. 6.RMCS   2. 15.5 27.7 19.3  55. 1.320 18.9 1.025   -0. -0.
1. 40.80.FLDV MONZA           231. 6.RMCS   3. 15.0 25.0 18.3  73. 1.194 19.3 0.948 3500. -0.
1. 40.75.FLDV SKYHAWK         231. 6.RMCS  15. 18.0 25.6 20.8  55. 1.096 19.4 1.074   -0. -0.
```

```
1. 40.76.FLDV SKYHAWK       231. 6.RMCS  30. 18.0 29.6 21.9  55. 1.274 18.8 1.158    -0. -0.
1. 40.80.FLDV SKYHAWK       231. 6.RMCS   4. 15.0 24.0 18.0  47. 1.155 20.4 0.884    -0. -0.
1. 40.76.FLDV SKYLARK       231. 6.RMCS   1. 16.2 24.9 19.2  55. 1.329 16.3 1.182    -0. -0.
1. 40.75.FLDV STARFIRE      231. 6.RMCS  24. 18.0 25.6 20.8  55. 1.139 19.2 1.082    -0. -0.
1. 40.76.FLDV STARFIRE      231. 6.RMCS  22. 18.0 29.6 21.9  55. 1.168 20.9 1.047    -0. -0.
1. 40.79.FLDV STARFIRE      231. 6.RMCS   1. 16.0 27.0 19.6  50. 0.901 16.5 1.187 3500. -0.
1. 40.80.FLDV STARFIRE      231. 6.RMCS   7. 15.0 24.0 18.0  58. 1.261 16.1 1.122    -0. -0.
1. 40.76.FLDV SUNBIRD       231. 6.RMCS   8. 18.0 29.6 21.9  55. 1.082 22.2 0.985    -0. -0.
1. 40.78.FLDV SUNBIRD       231. 6.RMCS   1. 16.0 28.0 19.8 100. 1.562 15.9 1.250    -0. -0.
1. 40.75.FLDV CAMARO        250. 6.RACS   4. 15.9 20.5 17.7  55. 1.106 15.9 1.114    -0. -0.

1. 40.76.FLDV CAMARO        250. 6.RACS  10. 17.4 23.1 19.6  55. 1.227 16.3 1.201    -0. -0.
1. 40.77.FLDV CAMARO        250. 6.RACS   2. 17.0 22.0 18.9  75. 1.147 15.1 1.254 4000. -0.
1. 40.78.FLDV CAMARO        250. 6.RACS   1. 17.0 24.0 19.6 100. 1.646 13.9 1.404 4000. -0.
1. 40.79.FLDV CAMARO        250. 6.RACS   1. 16.0 24.0 18.8   0. 0.753 19.6 0.959    -0. -0.
1. 40.75.FLDV CUTLASS       250. 6.RACS   2. 15.9 20.5 17.7  55. 1.181 14.3 1.235    -0. -0.
1. 40.75.FLDV FIREBIRD      250. 6.RACS   1. 15.9 20.5 17.7  55. 1.163 15.1 1.174    -0. -0.
1. 40.76.FLDV FIREBIRD      250. 6.RACS   3. 17.4 23.1 19.6  55. 1.362 13.9 1.410    -0. -0.
1. 40.77.FLDV IMPALA        250. 6.RACS   3. 17.0 22.0 18.9  55. 1.082 16.2 1.171 4000.  6.
1. 40.78.FLDV IMPALA        250. 6.RACS   3. 16.6 23.7 19.2  55. 1.307 16.1 1.191    -0. -0.
1. 40.76.FLDV LE MANS       250. 6.RACS   3. 16.7 21.6 18.6  55. 1.166 12.6 1.476    -0. -0.

1. 40.77.FLDV MALIBU        250. 6.RACS   1. 17.0 22.0 18.9 100. 1.171 12.4 1.532 4000. -0.
1. 40.75.FLDV NOVA          250. 6.RACS  31. 15.9 20.5 17.7  56. 1.236 14.5 1.216 3500. -0.
1. 40.76.FLDV NOVA          250. 6.RACS  30. 17.7 23.5 19.9  55. 1.197 15.4 1.292    -0. -0.
1. 40.77.FLDV NOVA          250. 6.RACS   3. 18.0 23.0 19.9  85. 1.150 13.6 1.464 3833.  3.
1. 40.78.FLDV NOVA          250. 6.RACS   2. 18.0 24.0 20.3  75. 0.927 18.6 1.086 4000. -0.
1. 40.79.FLDV NOVA          250. 6.RACS   1. 16.0 24.0 18.8 100. 0.987 19.5 0.967 3500. -0.
1. 40.75.FLDV OMEGA         250. 6.RACS  29. 15.9 20.5 17.7  55. 1.173 14.7 1.204    -0. -0.
1. 40.76.FLDV OMEGA         250. 6.RACS  22. 17.6 23.3 19.8  55. 1.211 15.7 1.259    -0. -0.
1. 40.75.FLDV VENTURA       250. 6.RACS  25. 15.9 20.5 17.7  55. 1.197 14.7 1.198    -0. -0.
1. 40.76.FLDV VENTURA       250. 6.RACS   9. 17.6 23.4 19.8  55. 1.269 14.7 1.349    -0. -0.

1. 40.75.FLDV LE MANS W     250. 6.RACW   4. 15.9 20.5 17.7  55. 1.164 15.2 1.164    -0. -0.
1. 40.75.FLDV CAMARO        250. 6.RMCS   3. 16.8 23.9 19.4  55. 1.206 15.6 1.238    -0. -0.
1. 40.76.FLDV CAMARO        250. 6.RMCS   1. 17.5 24.9 20.2  55. 0.912 20.1 1.006    -0. -0.
1. 40.79.FLDV CAMARO        250. 6.RMCS   1. 18.0 27.0 21.2 100. 1.083 17.6 1.203 4000. -0.
1. 40.75.FLDV FIREBIRD      250. 6.RMCS   1. 16.8 23.9 19.4  55. 1.072 14.2 1.366    -0. -0.
1. 40.76.FLDV FIREBIRD      250. 6.RMCS   4. 17.5 24.9 20.2  55. 1.150 18.1 1.112    -0. -0.
1. 40.75.FLDV NOVA          250. 6.RMCS   5. 16.8 23.9 19.4  55. 1.204 18.5 1.044    -0. -0.
1. 40.76.FLDV NOVA          250. 6.RMCS   4. 17.8 25.3 20.5  55. 1.278 17.8 1.153    -0. -0.
1. 40.75.FLDV OMEGA         250. 6.RMCS   2. 16.8 23.9 19.4  55. 1.146 15.3 1.266    -0. -0.
1. 40.76.FLDV OMEGA         250. 6.RMCS   1. 17.5 24.9 20.2  55. 1.081 19.1 1.059    -0. -0.

1. 40.75.FLDV VENTURA       250. 6.RMCS   1. 16.8 23.9 19.4  55. 0.864 18.5 1.047    -0. -0.
1. 40.76.FLDV VENTURA       250. 6.RMCS   1. 17.5 24.9 20.2  55. 1.076 17.3 1.166    -0. -0.
1. 40.80.FLDV ELECTRA       252. 6.RACS  18. 17.0 23.0 19.3  51. 1.225 16.9 1.143 4000.  6.
1. 40.80.FLDV LESABRE       252. 6.RACS  19. 17.0 23.0 19.3  53. 1.231 16.3 1.183 4500.  6.
1. 40.75.FLDV CUTLASS       260. 8.RACS  27. 15.2 18.7 16.6  57. 1.156 14.4 1.154 4000. -0.
1. 40.76.FLDV CUTLASS       260. 8.RACS   6. 15.7 21.7 17.9  63. 1.186 13.7 1.304 4500. -0.
1. 40.78.FLDV CUTLASS       260. 8.RACS  38. 19.2 26.7 22.0  56. 1.131 17.4 1.263 3875.  5.
1. 40.79.FLDV CUTLASS       260. 8.RACS   3. 19.0 25.0 21.3  60. 1.001 18.7 1.141 3667   5.
1. 40.80.FLDV CUTLASS       260. 8.RACS   3. 19.0 25.0 21.3  68. 1.278 15.1 1.414 4000.  5.
1. 40.81.FLDV CUTLASS       260. 8.RACS   4. 19.0 27.0 21.9  63. 0.983 18.0 1.221    -0. -0.

1. 40.78.FLDV DELTA 88      260. 8.RACS  30. 18.3 24.9 20.8  55. 1.042 16.4 1.267    -0. -0.
1. 40.76.FLDV LE MANS       260. 8.RACS   1. 15.6 21.7 17.9  55. 1.321 14.0 1.272    -0. -0.
1. 40.75.FLDV OMEGA         260. 8.RACS  31. 14.8 18.8 16.4  55. 1.171 14.6 1.119 4000. -0.
1. 40.76.FLDV OMEGA         260. 8.RACS  30. 16.2 22.9 18.7  55. 1.249 14.5 1.288    -0. -0.
1. 40.75.FLDV VENTURA       260. 8.RACS  23. 14.8 18.8 16.4  55. 1.128 14.8 1.109    -0. -0.
1. 40.76.FLDV VENTURA       260. 8.RACS  30. 16.2 22.9 18.7  55. 1.261 14.4 1.296    -0. -0.
1. 40.78.FLDV CUTLASS W     260. 8.RACW  30. 18.3 24.9 20.8  55. 1.126 16.5 1.259    -0. -0.
1. 40.76.FLDV OMEGA         260. 8.RMCS   1. 16.3 25.4 19.4  55. 1.109 15.1 1.284    -0. -0.
1. 40.75.FLDV VENTURA       260. 8.RMCS   1. 14.7 21.4 17.1  55. 1.017 16.7 1.027    -0. -0.
1. 40.76.FLDV VENTURA       260. 8.RMCS   3. 16.3 25.4 19.4  55. 1.215 16.1 1.209    -0. -0.
```

```
1. 40.75.FLDV MONZA            262. 8.RACS   30. 15.4 22.3 17.9  55. 1.119 16.3 1.101   -0.  -0.
1. 40.76.FLDV MONZA            262. 8.RACS   18. 15.5 21.5 17.7  55. 1.233 15.9 1.109   -0.  -0.
1. 40.75.FLDV NOVA             262. 8.RACS   15. 14.3 18.7 16.0  56. 1.184 14.1 1.132 4000.  -0.
1. 40.75.FLDV MONZA            262. 8.RMCS   12. 15.3 23.2 18.1  55. 1.143 18.5 0.976   -0.  -0.
1. 40.76.FLDV MONZA            262. 8.RMCS    1. 14.6 22.3 17.3  55. 1.108 16.0 1.081   -0.  -0.
1. 40.80.FLDV BONNEVILLE       265. 8.RACS   16. 16.0 23.0 18.5  49. 1.188 15.7 1.183   -0.  -0.
1. 40.81.FLDV BONNEVILLE       265. 8.RACS    1. 18.0 27.0 21.2   0. 0.705 23.1 0.916   -0.  -0.
1. 40.80.FLDV CENTURY          265. 8.RACS   10. 17.0 26.0 20.1  62. 1.279 14.8 1.357   -0.  -0.
1. 40.81.FLDV CENTURY          265. 8.RACS    2. 19.0 28.0 22.2  63. 0.982 16.6 1.339   -0.  -0.
1. 40.80.FLDV CUTLASS          265. 8.RACS   30. 19.0 25.0 21.3  53. 1.220 16.9 1.258   -0.  -0.

1. 40.80.FLDV DELTA 88         265. 8.RACS    8. 17.0 23.0 19.3  33. 1.126 16.0 1.203   -0.  -0.
1. 40.80.FLDV GRAND PRIX       265. 8.RACS   10. 17.0 26.0 20.1  57. 1.262 15.5 1.296   -0.  -0.
1. 40.80.FLDV LE MANS          265. 8.RACS   14. 17.0 26.0 20.1  45. 1.122 16.6 1.215 3500.   5.
1. 40.80.FLDV REGAL            265. 8.RACS    8. 17.0 26.0 20.1  54. 1.197 16.7 1.207   -0.  -0.
1. 40.81.FLDV REGAL            265. 8.RACS    1. 18.0 27.0 21.2  25. 0.811 23.3 0.909   -0.  -0.
1. 40.80.FLDV CENTURY W        265. 8.RACW    1. 16.0 23.0 18.5  78. 1.507 13.2 1.408   -0.  -0.
1. 40.80.FLDV CUTLASS W        265. 8.RACW    4. 17.0 23.0 19.3  33. 0.960 17.4 1.103   -0.  -0.
1. 40.80.FLDV CAMARO           267. 8.RACS    3. 16.0 25.0 19.1  45. 1.279 13.2 1.445   -0.  -0.
1. 40.80.FLDV IMPALA           267. 8.RACS   32. 17.0 25.0 19.9  51. 1.235 15.9 1.250   -0.  -0.
1. 40.79.FLDV MALIBU           267. 8.RACS    5. 18.0 24.0 20.3  63. 1.071 17.2 1.180 3650.   5.

1. 40.80.FLDV MALIBU           267. 8.RACS   11. 17.0 24.0 19.6  42. 1.097 16.8 1.170 3750.   5.
1. 40.81.FLDV MALIBU           267. 8.RACS    1. 18.0 26.0 20.9 100. 1.425 17.3 1.204   -0.  -0.
1. 40.79.FLDV MONTE CARLO      267. 8.RACS    1. 18.0 24.0 20.3 100. 1.384 11.9 1.698 3500.  -0.
1. 40.80.FLDV MONTE CARLO      267. 8.RACS   15. 17.0 24.0 19.6  59. 1.222 15.5 1.258   -0.  -0.
1. 40.80.FLDV IMPALA W         267. 8.RACW    4. 16.0 23.0 18.5  37. 1.103 15.4 1.205   -0.  -0.
1. 40.80.FLDV MALIBU W         267. 8.RACW    4. 17.0 22.0 18.9  29. 1.259 15.0 1.262   -0.  -0.
1. 40.78.FLDV BONNEVILLE       301. 8.RACS    1. 17.0 24.0 19.6  75. 0.937 13.5 1.445 4500.  -0.
1. 40.80.FLDV BONNEVILLE       301. 8.RACS   15. 16.0 24.0 18.8  46. 1.141 16.1 1.166   -0.  -0.
1. 40.77.FLDV CATALINA         301. 8.RACS    4. 17.0 23.0 19.3  55. 1.077 15.7 1.227 4000.   6.
1. 40.78.FLDV CATALINA         301. 8.RACS   30. 17.0 24.0 19.6  55. 1.074 16.5 1.184 4000.   6.

1. 40.79.FLDV CATALINA         301. 8.RACS    1. 17.0 24.0 19.6  55. 1.075 17.3 1.131 4000.   6.
1. 40.80.FLDV CENTURY          301. 8.RACS    3. 17.0 25.0 19.9  44. 1.050 15.6 1.267 3500.  -0.
1. 40.79.FLDV FIREBIRD         301. 8.RACS    2. 16.5 23.0 18.9  63. 1.015 15.9 1.185 4000.  -0.
1. 40.80.FLDV FIREBIRD         301. 8.RACS   12. 14.9 21.8 17.4  60. 1.206 13.3 1.308   -0.  -0.
1. 40.81.FLDV FIREBIRD         301. 8.RACS    1. 16.0 22.0 18.2  75. 1.249 14.8 1.230   -0.  -0.
1. 40.77.FLDV GRAND PRIX       301. 8.RACS    1. 16.0 23.0 18.5  55. 1.068 14.4 1.287 4000.   4.
1. 40.78.FLDV GRAND PRIX       301. 8.RACS   35. 17.3 24.1 19.9  56. 1.089 16.3 1.220 3900.   5.
1. 40.79.FLDV GRAND PRIX       301. 8.RACS    3. 17.3 24.0 19.8  75. 1.184 13.2 1.497 3500.  -0.
1. 40.80.FLDV GRAND PRIX       301. 8.RACS    6. 17.0 25.0 19.9  62. 1.124 16.2 1.226 3500.  -0.
1. 40.78.FLDV LE MANS          301. 8.RACS   28. 16.8 24.3 19.5  55. 1.052 16.7 1.164   -0.  -0.

1. 40.79.FLDV LE MANS          301. 8.RACS    1. 18.0 24.0 20.3  75. 1.309 15.0 1.348 3500.  -0.
1. 40.80.FLDV LE MANS          301. 8.RACS    3. 17.0 25.0 19.9  18. 1.010 19.2 1.030   -0.  -0.
1. 40.78.FLDV LESABRE          301. 8.RACS   33. 16.8 24.3 19.5  55. 1.144 14.5 1.346 4500.   6.
1. 40.79.FLDV LESABRE          301. 8.RACS    1. 17.0 24.0 19.6  50. 1.000 14.6 1.336 4000.  -0.
1. 40.80.FLDV LESABRE          301. 8.RACS   21. 16.0 24.0 18.8  48. 1.222 14.8 1.272   -0.  -0.
1. 40.79.FLDV REGAL            301. 8.RACS    1. 18.0 24.0 20.3  75. 1.372 14.7 1.383 3500.  -0.
1. 40.80.FLDV REGAL            301. 8.RACS    5. 17.0 25.0 19.9  68. 1.262 15.8 1.255   -0.  -0.
1. 40.80.FLDV BONNEVILLE W     301. 8.RACW    3. 15.0 21.0 17.2  72. 1.311 12.8 1.345   -0.  -0.
1. 40.80.FLDV ESTATE W         301. 8.RACW    2. 15.0 21.0 17.2  32. 0.849 16.4 1.046   -0.  -0.
1. 40.80.FLDV LE MANS W        301. 8.RACW    5. 16.0 24.0 18.8  48. 1.120 16.1 1.167   -0.  -0.

1. 40.80.FLDV RIVIERA          305. 8.FACS    7. 17.0 25.0 19.9  52. 1.186 14.1 1.408   -0.  -0.
1. 40.80.FLDV TORONADO         305. 8.FACS   16. 17.0 25.0 19.9  63. 1.250 14.9 1.333   -0.  -0.
1. 40.76.FLDV CAMARO           305. 8.RACS   26. 15.3 20.6 17.3  55. 1.168 15.2 1.136   -0.  -0.
1. 40.78.FLDV CAMARO           305. 8.RACS    2. 15.5 21.5 17.7  75. 1.061 17.3 1.019 4000.  -0.
1. 40.79.FLDV CAMARO           305. 8.RACS    2. 16.0 21.0 17.9  78. 1.106 16.6 1.081 4000.   3.
1. 40.80.FLDV CAMARO           305. 8.RACS    4. 17.0 25.0 19.9  60. 1.232 14.9 1.335   -0.  -0.
1. 40.81.FLDV CAMARO           305. 8.RACS    1. 16.0 23.0 18.5  50. 0.961 14.9 1.247   -0.  -0.
1. 40.78.FLDV CENTURY          305. 8.RACS   14. 17.4 24.5 20.0  55. 1.167 15.9 1.255   -0.  -0.
1. 40.78.FLDV CUTLASS          305. 8.RACS   21. 17.8 25.5 20.6  57. 1.116 15.6 1.317 3750.   5.
1. 40.79.FLDV CUTLASS          305. 8.RACS    1. 17.0 23.0 19.3  50. 0.963 14.9 1.290 3500.  -0.
```

```
1. 40.80.FLDV CUTLASS          305. 8.RACS    1. 17.0 24.0 19.6 100. 1.990 11.3 1.733    -0. -0.
1. 40.80.FLDV DELTA 88         305. 8.RACS   31. 17.0 25.0 19.9  41. 1.145 15.9 1.247    -0. -0.
1. 40.81.FLDV DELTA 88         305. 8.RACS    2. 16.5 25.8 19.7  63. 1.065 16.7 1.183    -0. -0.
1. 40.81.FLDV ELECTRA          305. 8.RACS    1. 16.0 27.0 19.6  50. 1.180 16.3 1.204    -0. -0.
1. 40.78.FLDV FIREBIRD         305. 8.RACS    1. 16.0 22.0 18.2 100. 1.374 13.5 1.350 4000. -0.
1. 40.77.FLDV IMPALA           305. 8.RACS    2. 16.0 21.0 17.9  55. 1.080 14.9 1.199 4000.  6.
1. 40.78.FLDV IMPALA           305. 8.RACS   52. 16.1 22.2 18.4  56. 1.102 15.0 1.228 4023.  6.
1. 40.79.FLDV IMPALA           305. 8.RACS    5. 16.0 21.0 17.9  68. 1.054 14.1 1.267 4000.  6.
1. 40.80.FLDV IMPALA           305. 8.RACS   14. 17.0 25.0 19.9  35. 1.094 16.1 1.230 4000. -0.
1. 40.81.FLDV IMPALA           305. 8.RACS    4. 16.8 25.5 19.7  57. 1.088 16.4 1.209    -0. -0.

1. 40.78.FLDV LE MANS          305. 8.RACS   31. 17.3 24.2 19.8  56. 1.158 15.6 1.268    -0. -0.
1. 40.81.FLDV LESABRE          305. 8.RACS    2. 16.5 25.8 19.7  88. 1.230 13.8 1.425    -0. -0.
1. 40.76.FLDV MALIBU           305. 8.RACS    1. 14.0 20.0 16.2  75. 1.224 13.3 1.219 4000. -0.
1. 40.78.FLDV MALIBU           305. 8.RACS   29. 17.2 24.1 19.7  55. 1.075 16.5 1.200 4500.  5.
1. 40.80.FLDV MALIBU           305. 8.RACS    2. 17.0 24.0 19.6  31. 0.971 15.3 1.274    -0. -0.
1. 40.81.FLDV MALIBU           305. 8.RACS    2. 16.0 23.0 18.5 100. 1.231 14.5 1.276    -0. -0.
1. 40.76.FLDV MONTE CARLO      305. 8.RACS    1. 14.4 20.3 16.6  55. 1.156 15.3 1.082    -0. -0.
1. 40.78.FLDV MONTE CARLO      305. 8.RACS    2. 17.0 25.0 19.9  55. 1.074 18.0 1.103 4500.  5.
1. 40.79.FLDV MONTE CARLO      305. 8.RACS    2. 17.0 23.0 19.3  75. 0.991 17.6 1.094 3500. -0.
1. 40.76.FLDV NOVA             305. 8.RACS   24. 15.3 20.6 17.3  58. 1.159 14.7 1.180 3500. -0.

1. 40.77.FLDV NOVA             305. 8.RACS    3. 16.0 21.0 17.9  55. 1.065 15.0 1.195 3500.  3.
1. 40.78.FLDV NOVA             305. 8.RACS    1. 16.0 22.0 18.2  50. 0.907 18.0 1.012 4000. -0.
1. 40.79.FLDV NOVA             305. 8.RACS    2. 16.0 21.0 17.9  63. 0.925 15.6 1.149 3500. -0.
1. 40.78.FLDV OMEGA            305. 8.RACS    1. 16.0 22.0 18.2 100. 1.277 13.7 1.330 4000. -0.
1. 40.78.FLDV REGAL            305. 8.RACS   23. 17.4 24.5 20.0  59. 1.137 15.7 1.268 3500. -0.
1. 40.80.FLDV 98               305. 8.RACS   12. 17.0 25.0 19.9  45. 1.132 16.0 1.244    -0. -0.
1. 40.81.FLDV 98               305. 8.RACS    2. 17.0 28.0 20.6  63. 1.164 14.9 1.382    -0. -0.
1. 40.78.FLDV CENTURY          305. 8.RACW   20. 16.0 22.5 18.4  55. 1.126 15.1 1.219    -0. -0.
1. 40.80.FLDV CUST CRUISER W   305. 8.RACW    1. 15.0 22.0 17.5 100. 1.519 14.0 1.252    -0. -0.
1. 40.78.FLDV CUTLASS W        305. 8.RACW   22. 15.8 22.8 18.3  55. 1.018 14.4 1.273    -0. -0.

1. 40.78.FLDV IMPALA           305. 8.RACW    5. 14.3 19.7 16.3  55. 0.946 14.8 1.103    -0. -0.
1. 40.78.FLDV IMPALA W         305. 8.RACW   12. 14.3 19.7 16.3  55. 1.103 14.0 1.163    -0. -0.
1. 40.80.FLDV IMPALA W         305. 8.RACW    1. 15.0 21.0 17.2  42. 1.329 14.9 1.157    -0. -0.
1. 40.78.FLDV LE MANS W        305. 8.RACW   30. 16.2 22.4 18.5  55. 1.069 15.6 1.180    -0. -0.
1. 40.78.FLDV MALIBU           305. 8.RACW   21. 16.2 22.4 18.5  55. 1.086 15.7 1.179    -0. -0.
1. 40.78.FLDV MALIBU W         305. 8.RACW   10. 16.2 22.4 18.5  55. 1.059 15.0 1.232    -0. -0.
1. 40.76.FLDV CAMARO           305. 8.RMCS    1. 15.4 21.0 17.5  55. 1.274 15.9 1.096    -0. -0.
1. 40.78.FLDV MALIBU           305. 8.RMCS    1. 16.0 22.8 18.5  55. 1.592 17.0 1.087    -0. -0.
1. 40.78.FLDV MALIBU           305. 8.RMCW    1. 14.6 21.0 16.9  55. 1.140 12.8 1.324    -0. -0.
1. 40.79.FLDV RIVIERA          350. 8.FACS    1. 16.0 22.0 18.2  75. 0.906 15.4 1.181 4000. -0.

1. 40.80.FLDV RIVIERA          350. 8.FACS   20. 15.0 22.0 17.5  57. 1.227 14.5 1.205    -0. -0.
1. 40.79.FLDV TORONADO         350. 8.FACS    1. 16.0 22.0 18.2  55. 1.075 16.7 1.092 4250.  5.
1. 40.80.FLDV TORONADO         350. 8.FACS   10. 15.0 22.0 17.5  72. 1.334 12.9 1.359    -0. -0.
1. 40.79.FLDV ELDORADO         350. 8.FAIS    1. 14.0 22.0 16.7 100. 1.277 16.6 1.009 4000. -0.
1. 40.79.FLDV SEVILLE          350. 8.FAIS    2. 14.0 19.0 15.9  88. 1.038 12.7 1.250 4500. -0.
1. 40.77.FLDV BONNEVILLE       350. 8.RACS    1. 16.0 22.0 18.2  75. 0.897 13.4 1.360 4000. -0.
1. 40.75.FLDV CAMARO           350. 8.RACS   21. 13.7 19.1 15.7  55. 1.199 13.6 1.153    -0. -0.
1. 40.76.FLDV CAMARO           350. 8.RACS   11. 13.8 18.5 15.6  55. 1.140 13.7 1.132    -0. -0.
1. 40.77.FLDV CAMARO           350. 8.RACS    2. 15.0 20.0 16.9  50. 1.067 13.0 1.298 4000. -0.
1. 40.78.FLDV CAMARO           350. 8.RACS    1. 15.0 21.0 17.2  50. 0.950 13.2 1.306 4000. -0.

1. 40.79.FLDV CAMARO           350. 8.RACS    2. 16.0 21.0 17.9  75. 1.120 13.1 1.374 4000. -0.
1. 40.80.FLDV CAMARO           350. 8.RACS    2. 14.0 17.0 15.2  47. 1.163 13.4 1.130    -0. -0.
1. 40.81.FLDV CAMARO           350. 8.RACS    1. 16.0 21.0 17.9 100. 1.022 14.8 1.212    -0. -0.
1. 40.75.FLDV CENTURY          350. 8.RACS   30. 12.4 19.1 14.7  55. 1.131 12.4 1.186    -0. -0.
1. 40.76.FLDV CENTURY          350. 8.RACS    7. 14.0 20.5 16.3  55. 1.235 13.7 1.188    -0. -0.
1. 40.76.FLDV CORVETTE         350. 8.RACS   30. 13.8 18.5 15.6  55. 1.178 13.9 1.117    -0. -0.
1. 40.80.FLDV CORVETTE         350. 8.RACS   15. 14.0 20.0 16.2  62. 1.219 13.6 1.108    -0. -0.
1. 40.75.FLDV CUTLASS          350. 8.RACS   30. 14.6 19.7 16.5  55. 1.139 13.7 1.203    -0. -0.
1. 40.76.FLDV CUTLASS          350. 8.RACS   31. 15.3 21.0 17.4  56. 1.105 13.6 1.276 4500. -0.
1. 40.77.FLDV CUTLASS          350. 8.RACS   10. 16.0 21.0 17.9  54. 1.012 14.0 1.274 4500.  5.
```

```
1. 40.75.FLDV DELTA 88         350. 8.RACS   30. 13.7 18.3 15.4  55. 1.144 13.4 1.158   -0. -0.
1. 40.76.FLDV DELTA 88         350. 8.RACS   30. 13.5 18.3 15.3  55. 1.118 13.2 1.159   -0. -0.
1. 40.77.FLDV DELTA 88         350. 8.RACS    6. 16.0 22.0 18.2  63. 1.084 14.9 1.227 4833.  6.
1. 40.78.FLDV DELTA 88         350. 8.RACS   41. 16.6 23.2 19.0  56. 1.098 15.5 1.228 4909.  6.
1. 40.79.FLDV DELTA 88         350. 8.RACS    1. 16.0 22.0 18.2  50. 0.980 16.3 1.117   -0. -0.
1. 40.80.FLDV DELTA 88         350. 8.RACS   15. 15.0 22.0 17.5  56. 1.235 14.9 1.181   -0. -0.
1. 40.78.FLDV ELECTRA          350. 8.RACS   31. 15.2 21.4 17.5  55. 1.035 14.9 1.180 4500. -0.
1. 40.80.FLDV ELECTRA          350. 8.RACS   26. 15.0 22.0 17.5  46. 1.116 14.9 1.174   -0. -0.
1. 40.75.FLDV FIREBIRD         350. 8.RACS   30. 13.3 18.3 15.1  55. 1.185 12.8 1.178   -0. -0.
1. 40.76.FLDV FIREBIRD         350. 8.RACS   21. 15.8 20.8 17.7  55. 1.246 12.6 1.409   -0. -0.

1. 40.76.FLDV GRAND PRIX       350. 8.RACS   22. 14.0 19.3 16.0  55. 1.199 11.9 1.340 4500. -0.
1. 40.77.FLDV GRAND PRIX       350. 8.RACS    1. 14.0 21.0 16.5 100. 1.330  9.9 1.669 4500. -0.
1. 40.75.FLDV IMPALA           350. 8.RACS   30. 12.4 18.0 14.4  55. 1.167 12.1 1.191   -0. -0.
1. 40.76.FLDV IMPALA           350. 8.RACS   30. 12.9 18.2 14.8  55. 1.154 13.0 1.146   -0. -0.
1. 40.77.FLDV IMPALA           350. 8.RACS    2. 15.0 20.0 16.9  88. 1.158 12.9 1.311 4000. -0.
1. 40.78.FLDV IMPALA           350. 8.RACS   11. 14.9 20.7 17.0  55. 1.061 14.7 1.152 4400.  6.
1. 40.79.FLDV IMPALA           350. 8.RACS    3. 16.0 21.0 17.9  75. 1.010 13.5 1.325 4000. -0.
1. 40.75.FLDV LE MANS          350. 8.RACS   30. 11.7 17.9 13.8  55. 1.092 12.9 1.075   -0. -0.
1. 40.76.FLDV LE MANS          350. 8.RACS   30. 14.0 19.3 16.0  55. 1.263 12.6 1.270   -0. -0.
1. 40.75.FLDV LESABRE          350. 8.RACS   31. 12.4 16.5 14.0  56. 1.169 11.4 1.226 4500. -0.

1. 40.76.FLDV LESABRE          350. 8.RACS    1. 14.0 18.0 15.6  75. 1.025 12.1 1.282 4500. -0.
1. 40.77.FLDV LESABRE          350. 8.RACS    5. 15.2 21.2 17.4  64. 1.104 15.9 1.099 4800.  6.
1. 40.78.FLDV LESABRE          350. 8.RACS   30. 15.3 21.5 17.5  55. 1.086 14.1 1.244   -0. -0.
1. 40.79.FLDV LESABRE          350. 8.RACS    1. 15.0 20.0 16.9 100. 1.146 12.4 1.360 4000. -0.
1. 40.80.FLDV LESABRE          350. 8.RACS    1. 15.0 23.0 17.8  50. 0.830 14.1 1.263 4000. -0.
1. 40.75.FLDV MALIBU           350. 8.RACS    1. 13.0 18.0 14.9  75. 1.195 10.1 1.467 4000. -0.
1. 40.75.FLDV MONTE CARLO      350. 8.RACS   32. 13.3 17.5 14.9  57. 1.176 12.2 1.217 4500. -0.
1. 40.76.FLDV MONTE CARLO      350. 8.RACS   31. 13.6 18.0 15.3  55. 1.178 12.4 1.233 4500. -0.
1. 40.75.FLDV NOVA             350. 8.RACS   31. 14.1 18.9 15.9  56. 1.265 12.8 1.247 4000. -0.
1. 40.76.FLDV NOVA             350. 8.RACS    3. 13.8 18.5 15.6  55. 1.095 14.5 1.075   -0. -0.

1. 40.75.FLDV OMEGA            350. 8.RACS   19. 13.4 18.4 15.2  55. 1.222 12.7 1.197   -0. -0.
1. 40.76.FLDV OMEGA            350. 8.RACS    5. 14.4 20.6 16.7  55. 1.358 14.0 1.183   -0. -0.
1  40.75.FLDV REGAL            350. 8.RACS   29. 12.4 19.1 14.7  55. 1.199 12.0 1.229   -0. -0.
1. 40.76.FLDV REGAL            350. 8.RACS   19. 14.0 20.5 16.3  55. 1.158 13.3 1.222   -0. -0.
1. 40.78.FLDV RIVIERA          350. 8.RACS   16. 15.2 21.4 17.5  55. 1.121 14.5 1.208   -0. -0.
1. 40.75.FLDV VENTURA          350. 8.RACS   29. 13.5 19.0 15.6  55. 1.176 13.6 1.143   -0. -0.
1. 40.76.FLDV VENTURA          350. 8.RACS    4. 14.4 20.4 16.6  55. 1.316 13.2 1.259   -0. -0.
1. 40.77.FLDV 98               350. 8.RACS    3. 16.0 21.0 17.9  53. 1.012 14.9 1.203 4500.  6.
1. 40.78.FLDV 98               350. 8.RACS   28. 15.0 21.4 17.4  55. 1.056 14.9 1.171 4500.  6.
1. 40.80.FLDV 98               350. 8.RACS   26. 15.0 22.0 17.5  62. 1.218 15.3 1.141   -0. -0.

1. 40.78.FLDV CATALINA W       350. 8.RACW    5. 15.2 21.4 17.5  55. 1.046 14.6 1.204   -0. -0.
1. 40.75.FLDV CENTURY          350. 8.RACW    5. 11.8 16.3 13.5  55. 1.102 12.3 1.093   -0. -0.
1. 40.76.FLDV CENTURY          350. 8.RACW    4. 13.5 18.3 15.3  55. 1.084 12.9 1.189   -0. -0.
1. 40.75.FLDV CENTURY W        350. 8.RACW    4. 11.8 16.3 13.5  55. 1.286 11.5 1.175   -0. -0.
1. 40.77.FLDV CUST CRUISER W   350. 8.RACW    7. 16.0 21.0 17.9  55. 1.027 14.2 1.265 4500.  9.
1. 40.78.FLDV CUST CRUISER W   350. 8.RACW   23. 15.0 21.4 17.4  55. 1.063 14.4 1.200 4500.  9.
1. 40.75.FLDV CUTLASS          350. 8.RACW    2. 13.7 18.2 15.4  55. 1.339 12.7 1.211   -0. -0.
1. 40.76.FLDV CUTLASS          350. 8.RACW    1. 13.8 17.5 15.2  55. 1.094 10.5 1.455   -0. -0.
1. 40.75.FLDV CUTLASS W        350. 8.RACW    1. 13.7 18.2 15.4  55. 0.995 14.4 1.072   -0. -0.
1. 40.78.FLDV ESTATE W         350. 8.RACW   26. 15.2 21.4 17.5  55. 1.061 14.3 1.224   -0. -0.

1. 40.80.FLDV ESTATE W         350. 8.RACW    1. 15.0 22.0 17.5  58. 1.172 12.9 1.352   -0. -0.
1. 40.78.FLDV IMPALA           350. 8.RACW   12. 13.8 19.3 15.9  55. 1.116 13.1 1.207   -0. -0.
1. 40.78.FLDV IMPALA W         350. 8.RACW    7. 13.8 19.3 15.9  55. 1.088 13.9 1.140   -0. -0.
1. 40.75.FLDV LE MANS W        350. 8.RACW   25. 11.7 17.9 13.8  55. 1.144 13.3 1.041   -0. -0.
1. 40.77.FLDV VISTACRUISER W   350. 8.RACW    1. 14.0 19.0 15.9  55. 1.012 14.3 1.110 5000.  7.
1. 40.76.FLDV SEVILLE          350. 8.RAIS   31. 14.7 20.6 16.9  55. 1.197 12.7 1.328 4500.  3.
1. 40.75.FLDV CAMARO           350. 8.RMCS    6. 12.2 19.6 14.7  55. 1.263 15.3 0.964   -0. -0.
1. 40.76.FLDV CAMARO           350. 8.RMCS    2. 12.9 18.6 14.9  55. 1.013 14.9 1.006   -0. -0.
1. 40.80.FLDV CAMARO           350. 8.RMCS    3. 14.0 21.0 16.5  70. 1.283 13.5 1.218   -0. -0.
1. 40.76.FLDV CORVETTE         350. 8.RMCS   12. 12.9 18.6 14.9  55. 1.138 13.3 1.120   -0. -0.
```

```
1. 40.80.FLDV CORVETTE         350. 8.RMCS  7. 14.0 20.0 16.2 58. 1.258 16.1 1.008   -0. -0.
1. 40.75.FLDV FIREBIRD         350. 8.RMCS  2. 11.2 18.6 13.6 55. 1.240 14.4 0.943   -0. -0.
1. 40.75.FLDV NOVA             350. 8.RMCS  2. 12.2 19.6 14.7 55. 1.296 13.8 1.063   -0. -0.
1. 40.80.FLDV ELDORADO         368. 8.FAIS 23. 14.0 22.0 16.7 46. 1.166 13.4 1.245   -0. -0.
1. 40.81.FLDV ELDORADO         368. 8.FAIS  2. 15.0 22.0 17.5 88. 1.224 13.3 1.319   -0. -0.
1. 40.80.FLDV SEVILLE          368. 8.FAIS 15. 14.0 22.0 16.7 66. 1.297 13.5 1.238   -0. -0.
1. 40.80.FLDV DEVILLE          368. 8.RACS  7. 15.0 23.0 17.8 46. 1.205 12.7 1.396   -0. -0.
1. 40.80.FLDV FLEETWOOD        368. 8.RACS  1. 15.0 23.0 17.8 50. 0.864 15.5 1.149 4500. -0.
1. 40.76.FLDV BONNEVILLE       400. 8.RACS  1. 13.0 17.0 14.5 75. 1.094 10.5 1.389 5000. -0.
1. 40.75.FLDV CATALINA         400. 8.RACS 30. 11.8 15.3 13.2 55. 1.140 12.3 1.069   -0. -0.

1. 40.75.FLDV DELTA 88         400. 8.RACS 14. 11.1 16.1 12.9 55. 1.085 12.5 1.032   -0. -0.
1. 40.75.FLDV FIREBIRD         400. 8.RACS 11. 13.5 18.6 15.4 55. 1.070 12.1 1.280 4000. -0.
1. 40.76.FLDV FIREBIRD         400. 8.RACS  4. 15.3 21.6 17.6 55. 1.250 13.3 1.328   -0. -0.
1. 40.75.FLDV GRAND PRIX       400. 8.RACS 30. 13.0 17.6 14.7 55. 1.112 12.6 1.164   -0. -0.
1. 40.76.FLDV GRAND PRIX       400. 8.RACS 27. 14.3 20.0 16.4 56. 1.117 12.2 1.338 4500. -0.
1. 40.77.FLDV GRAND PRIX       400. 8.RACS  1. 14.0 21.0 16.5 25. 0.991 15.2 1.086 4500. -0.
1. 40.75.FLDV IMPALA           400. 8.RACS 31. 11.5 16.6 13.3 56. 1.139 12.3 1.084 4500. -0.
1. 40.76.FLDV IMPALA           400. 8.RACS 11. 12.6 18.1 14.6 55. 1.120 13.3 1.099   -0. -0.
1. 40.75.FLDV LE MANS          400. 8.RACS  2. 12.3 18.2 14.4 55. 1.321 11.2 1.281   -0. -0.
1. 40.76.FLDV LE MANS          400. 8.RACS  3. 13.9 19.5 15.9 55. 1.164 13.6 1.173   -0. -0.

1. 40.75.FLDV MONTE CARLO      400. 8.RACS  8. 13.4 16.6 14.6 55. 1.215 12.1 1.209   -0. -0.
1. 40.76.FLDV MONTE CARLO      400. 8.RACS  5. 13.2 19.4 15.4 55. 1.060 12.9 1.191   -0. -0.
1. 40.75.FLDV CATALINA W       400. 8.RACW  5. 10.7 14.7 12.2 55. 1.072 12.4 0.983   -0. -0.
1. 40.75.FLDV IMPALA           400. 8.RACW  4. 10.7 14.7 12.2 55. 1.261 10.7 1.139   -0. -0.
1. 40.76.FLDV IMPALA           400. 8.RACW  3. 12.0 16.8 13.8 55. 1.103 11.0 1.258   -0. -0.
1. 40.75.FLDV IMPALA W         400. 8.RACW  6. 10.7 14.7 12.2 55. 1.100 11.3 1.078   -0. -0.
1. 40.76.FLDV IMPALA W         400. 8.RACW  5. 12.0 16.8 13.8 55. 1.240 11.9 1.160   -0. -0.
1. 40.75.FLDV LE MANS W        400. 8.RACW  6. 12.3 18.2 14.4 55. 1.069 12.4 1.167   -0. -0.
1. 40.76.FLDV LE MANS W        400. 8.RACW 12. 12.6 17.2 14.3 55. 1.284 12.0 1.194   -0. -0.
1. 40.75.FLDV FIREBIRD         400. 8.RMCS  8. 11.2 18.2 13.5 55. 1.129 12.8 1.055   -0. -0.

1. 40.76.FLDV FIREBIRD         400. 8.RMCS  3. 12.1 17.4 14.0 55. 1.161 10.7 1.304   -0. -0.
1. 40.77.FLDV TORONADO         403. 8.FACS  1. 13.0 19.0 15.1 55. 1.074 13.2 1.148 5000.  6.
1. 40.78.FLDV DELTA 88         403. 8.RACS  2. 14.1 19.7 16.2 55. 0.951 16.1 1.005   -0. -0.
1. 40.77.FLDV ELECTRA          403. 8.RACS  1. 15.0 21.0 17.2 55. 1.057 11.8 1.458 4500.  6.
1. 40.78.FLDV ELECTRA          403. 8.RACS 27. 14.1 19.7 16.2 55. 1.075 14.6 1.104 5000.  6.
1. 40.78.FLDV LESABRE          403. 8.RACS  1. 14.4 20.3 16.6 55. 1.164 14.5 1.144   -0. -0.
1. 40.78.FLDV RIVIERA          403. 8.RACS 12. 14.1 19.7 16.2 55. 1.068 14.3 1.127   -0. -0.
1. 40.77.FLDV 98               403. 8.RACS  2. 15.0 21.0 17.2 55. 1.070 14.7 1.168 4500.  6.
1. 40.78.FLDV 98               403. 8.RACS 30. 14.1 19.7 16.2 55. 1.074 14.5 1.109   -0. -0.
1. 40.78.FLDV CATALINA W       403. 8.RACW  1. 14.1 19.7 16.2 55. 1.165 13.0 1.246   -0. -0.

1. 40.78.FLDV CUST CRUISER W   403. 8.RACW 14. 14.1 19.7 16.2 55. 1.096 13.8 1.169   -0. -0.
1. 40.78.FLDV ESTATE W         403. 8.RACW 15. 14.1 19.7 16.2 55. 1.099 14.0 1.153   -0. -0.
1. 40.77.FLDV DEVILLE          425. 8.RACS  4. 14.0 18.0 15.6 60. 1.030 13.3 1.169 5000.  6.
1. 40.78.FLDV DEVILLE          425. 8.RACS 32. 12.9 18.8 15.0 56. 1.097 13.2 1.141 4750.  6.
1. 40.78.FLDV FLEETWOOD        425. 8.RACS  4. 12.9 18.8 15.0 55. 1.120 12.2 1.234   -0. -0.
1. 40.79.FLDV FLEETWOOD        425. 8.RACS  1. 14.0 20.0 16.2 50. 1.066 14.5 1.118 4500. -0.
1. 40.75.FLDV IMPALA           454. 8.RACS  3. 10.7 15.1 12.4 45. 0.953 11.7 1.054 5000. -0.
1. 40.76.FLDV IMPALA           454. 8.RACS  1. 12.0 15.8 13.5 55. 1.393 12.9 1.045   -0. -0.
1. 40.75.FLDV IMPALA           454. 8.RACW  2. 10.4 13.9 11.7 55. 1.247  8.0 1.459   -0. -0.
1. 40.76.FLDV IMPALA           454. 8.RACW  1. 12.0 15.4 13.3 55. 1.381 11.8 1.125   -0. -0.

1. 40.75.FLDV TORONADO         455. 8.FACS 31. 10.9 14.8 12.4 55. 1.134 11.6 1.073 5000. -0.
1. 40.76.FLDV TORONADO         455. 8.FACS 30. 12.5 17.4 14.3 55. 1.185 11.8 1.215   -0. -0.
1. 40.75.FLDV CATALINA         455. 8.RACS  1. 10.8 15.2 12.4 55. 1.148 10.9 1.136   -0. -0.
1. 40.76.FLDV CATALINA         455. 8.RACS  2. 12.5 17.5 14.4 55. 0.952 13.6 1.061   -0. -0.
1. 40.75.FLDV CUTLASS          455. 8.RACS  2. 13.5 19.0 15.5 55. 1.127 11.6 1.332   -0. -0.
1. 40.75.FLDV DELTA 88         455. 8.RACS 20. 12.5 17.5 14.3 55. 1.113 12.4 1.155   -0. -0.
1. 40.76.FLDV DELTA 88         455. 8.RACS 17. 11.7 17.8 13.8 55. 1.125 11.8 1.171   -0. -0.
1. 40.75.FLDV ELECTRA          455. 8.RACS 30. 10.8 15.2 12.4 55. 1.115 11.0 1.126   -0. -0.
1. 40.76.FLDV ELECTRA          455. 8.RACS 30. 11.7 17.8 13.8 55. 1.152 11.5 1.198   -0. -0.
1. 40.75.FLDV GRAND PRIX       455. 8.RACS  2. 11.9 16.9 13.7 55. 1.022 12.2 1.118   -0. -0.
```

```
1. 40.76.FLDV GRAND PRIX      455. 8.RACS    2. 13.8 20.1 16.1  55. 1.286 13.1 1.230   -0. -0.
1. 40.75.FLDV LESABRE         455. 8.RACS   13. 10.8 15.2 12.4  55. 1.166 11.3 1.093   -0. -0.
1. 40.75.FLDV RIVIERA         455. 8.RACS   31. 10.9 15.4 12.5  55. 1.133 11.4 1.106 5000. -0.
1. 40.76.FLDV RIVIERA         455. 8.RACS   30. 12.3 17.8 14.3  55. 1.207 11.1 1.285   -0. -0.
1. 40.75.FLDV 98              455. 8.RACS   30. 12.5 17.5 14.3  55. 1.107 12.4 1.158   -0. -0.
1. 40.76.FLDV 98              455. 8.RACS   30. 12.5 17.5 14.4  55. 1.147 12.3 1.170   -0. -0.
1. 40.76.FLDV CATALINA W      455. 8.RACW    5. 12.4 17.3 14.2  55. 1.163 11.7 1.218   -0. -0.
1. 40.75.FLDV CUST CRUISER W  455. 8.RACW    2. 11.7 16.1 13.3  55. 1.026 12.2 1.097   -0. -0.
1. 40.76.FLDV CUTLASS         455. 8.RACW    1. 12.7 17.9 14.6  55. 1.288 11.2 1.307   -0. -0.
1. 40.75.FLDV CUTLASS W       455. 8.RACW    7. 12.7 17.7 14.6  55. 1.083 12.1 1.203   -0. -0.

1. 40.76.FLDV CUTLASS W       455. 8.RACW    4. 13.4 18.7 15.4  55. 1.070 11.2 1.378   -0. -0.
1. 40.76.FLDV FIREBIRD        455. 8.RMCS    2. 11.7 16.8 13.5  55. 1.097 12.2 1.111   -0. -0.
1. 40.75.FLDV ELDORADO        500. 8.FACS   30. 11.2 16.0 12.9  55. 1.186 10.9 1.183   -0. -0.
1. 40.76.FLDV ELDORADO        500. 8.FACS   30. 11.7 15.8 13.3  55. 1.189 11.3 1.170   -0. -0.
1. 40.75.FLDV CALAIS          500. 8.RACS    4. 11.2 15.6 12.8  55. 1.006 12.1 1.057   -0. -0.
1. 40.76.FLDV CALAIS          500. 8.RACS    3. 11.7 15.8 13.3  55. 1.126 11.8 1.129   -0. -0.
1. 40.75.FLDV DEVILLE         500. 8.RACS   30. 11.2 15.6 12.8  55. 1.146 11.3 1.134   -0. -0.
1. 40.76.FLDV DEVILLE         500. 8.RACS   31. 11.7 15.8 13.3  55. 1.146 11.1 1.187 5500. -0.
1. 40.75.FLDV FLEETWOOD       500. 8.RACS   12. 11.2 15.5 12.7  55. 1.046 10.9 1.171 5500. -0.
1. 40.76.FLDV FLEETWOOD       500. 8.RACS   12. 11.7 15.8 13.3  55. 1.131 11.2 1.189   -0. -0.

1.120.80.CLDV 320 I           108. 4.RMIS    8. 25.0 36.0 29.0  49. 1.090 24.0 1.208   -0. -0.
1.120.80.FLDV 320 I           108. 4.RAIS    3. 27.0 31.0 28.7  45. 1.219 23.1 1.240   -0. -0.
1.120.80.FLDV 320 I           108. 4.RMIS   22. 25.0 36.0 29.0  58. 1.157 24.6 1.176   -0. -0.
1.200.80.CLDD 240D            147. 4.RADS    3. 26.0 29.0 27.3  39. 1.082 25.7 1.061   -0. -0.
1.200.80.CLDD 240D            147. 4.RMDS    4. 28.0 34.0 30.4  40. 1.208 29.4 1.034   -0. -0.
1.200.80.CLDD 300TD           183. 5.RADW    4. 24.0 30.2 26.4  40. 1.140 23.2 1.136   -0. -0.
1.200.80.FLDD 240D            147. 4.RADS   10. 26.0 29.0 27.3  40. 1.174 24.4 1.117   -0. -0.
1.200.75.FLDD 240D            147. 4.RMDS    2. 24.0 31.0 26.7  55. 1.076 25.2 1.060 4000.  4.
1.200.77.FLDD 240D            147. 4.RMDS    1. 25.0 34.0 28.4  55. 1.075 29.0 0.980 4000.  4.
1.200.78.FLDD 240D            147. 4.RMDS    1. 26.0 34.0 29.1  55. 1.076 25.9 1.125 4000.  4.

1.200.80.FLDD 240D            147. 4.RMDS    2. 28.0 34.0 30.4  49. 1.060 27.3 1.114   -0. -0.
1.200.76.FLDD 300D            183. 5.RADS    1. 22.0 28.0 24.3  55. 1.076 26.5 0.919 4500.  4.
1.200.77.FLDD 300D            183. 5.RADS    1. 23.0 28.0 25.0  55. 1.077 23.4 1.070 4500.  4.
1.200.78.FLDD 300D            183. 5.RADS    1. 22.0 28.0 24.3  55. 1.076 15.7 1.550 4500.  4.
1.200.80.FLDD 300TD           183. 5.RADW   11. 23.4 29.3 25.7  47. 1.144 23.2 1.109   -0. -0.
1.200.80.FLDV 450SL           275. 8.RAIS    1. 16.0 22.0 18.2  89. 1.536 12.8 1.421   -0. -0.
1.231.75.FLDV FIAT SPIDER     107. 4.RMCS    1. 18.0 31.0 22.2 100. 1.176 23.0 0.965 2750. -0.
1.231.79.FLDV BRAVA           122. 4.RMCS    1. 23.0 32.0 26.3  75. 1.008 22.9 1.149 2750. -0.
1.260.80.CLDV CIVIC            91. 4.FACS    3. 27.0 33.0 29.4  61. 1.117 28.7 1.023   -0. -0.
1.260.80.CLDV CIVIC W          91. 4.FACW    1. 25.0 29.0 26.6  39. 1.318 35.5 0.751   -0. -0.

1.260.79.CLDV CIVIC            91. 4.FMCS    1. 28.0 38.0 31.8  75. 1.117 32.9 0.966   -0. -0.
1.260.80.CLDV CIVIC            91. 4.FMCS    7. 32.0 45.0 36.8  58. 1.166 33.3 1.104   -0. -0.
1.260.81.CLDV CIVIC            91. 4.FMCS    2. 29.3 35.7 31.9  38. 1.060 30.1 1.068   -0. -0.
1.260.80.CLDV CIVIC W          91. 4.FMCW    3. 29.0 38.0 32.5  81. 1.315 29.5 1.100   -0. -0.
1.260.80.CLDV ACCORD          107. 4.FACS    4. 23.0 27.0 24.6  79. 1.273 21.5 1.146   -0. -0.
1.260.80.CLDV PRELUDE         107. 4.FACS    4. 23.0 32.0 26.3  72. 1.258 24.1 1.094   -0. -0.
1.260.80.CLDV ACCORD          107. 4.FMCS    8. 23.0 32.0 26.3  44. 1.159 26.7 0.988   -0. -0.
1.260.80.CLDV PRELUDE         107. 4.FMCS    7. 23.0 27.0 24.6  47. 1.120 28.3 0.871   -0. -0.
1.260.76.FLDV CIVIC            76. 4.FMCS    1. 28.0 41.0 32.7  50. 0.873 28.4 1.149 2000. -0.
1.260.77.FLDV CIVIC            76. 4.FMCS    1. 28.0 43.0 33.2  50. 0.859 31.6 1.051 2000. -0.

1.260.80.FLDV CIVIC            81. 4.FMCS   12. 28.0 37.7 31.6  64. 1.151 31.6 1.002   -0. -0.
1.260.81.FLDV CIVIC            81. 4.FMCS    2. 33.0 44.0 37.2  75. 1.193 33.3 1.114   -0. -0.
1.260.80.FLDV CIVIC            91. 4.FACS    3. 29.0 35.0 31.4  46. 1.110 28.5 1.105   -0. -0.
1.260.76.FLDV CIVIC W          91. 4.FACW    1. 26.0 37.0 30.0  75. 1.026 23.5 1.280 2250. -0.
1.260.80.FLDV CIVIC W          91. 4.FACW    3. 28.0 32.0 29.7  67. 1.286 24.0 1.236   -0. -0.
1.260.78.FLDV CIVIC            91. 4.FMCS    1. 36.0 44.0 39.2  25. 0.965 35.1 1.117 2250. -0.
1.260.80.FLDV CIVIC            91. 4.FMCS   18. 35.9 48.8 40.8  53. 1.181 34.8 1.171 2000. -0.
1.260.81.FLDV CIVIC            91. 4.FMCS    4. 34.0 44.0 37.9  44. 1.096 35.4 1.068   -0. -0.
1.260.75.FLDV CIVIC W          91. 4.FMCW    1. 27.0 39.0 31.3  50. 0.959 26.6 1.178 2250. -0.
1.260.79.FLDV CIVIC W          91. 4.FMCW    1. 28.0 37.0 31.4  50. 0.966 27.9 1.128 2250. -0.
```

```
1.260.80.FLDV CIVIC W          91. 4.FMCW   4. 31.0 42.0 35.1  60. 1.248 33.9 1.036   -0. -0.
1.260.78.FLDV ACCORD           98. 4.FACS   2. 28.0 33.0 30.0  38. 0.983 23.6 1.274 2250. -0.
1.260.77.FLDV ACCORD           98. 4.FMCS   2. 38.0 48.0 41.9  50. 1.006 27.0 1.551 2250. -0.
1.260.78.FLDV ACCORD           98. 4.FMCS   3. 33.0 44.0 37.2  67. 1.050 29.2 1.272 2250. -0.
1.260.80.FLDV ACCORD          107. 4.FACS  11. 23.0 28.0 25.0  43. 1.168 24.1 1.039   -0. -0.
1.260.81.FLDV ACCORD          107. 4.FACS   1. 24.0 28.0 25.6  75. 1.130 19.5 1.316   -0. -0.
1.260.80.FLDV PRELUDE         107. 4.FACS   5. 23.0 28.0 25.0  56. 1.257 25.1 0.997   -0. -0.
1.260.79.FLDV ACCORD          107. 4.FMCS   1. 26.0 35.0 29.4  50. 0.956 28.6 1.029   -0. -0.
1.260.80.FLDV ACCORD          107. 4.FMCS  28. 25.0 35.0 28.7  56. 1.163 29.0 0.988   -0. -0.
1.260.81.FLDV ACCORD          107. 4.FMCS   2. 27.0 36.0 30.4  38. 1.034 29.8 1.019   -0. -0.

1.260.80.FLDV PRELUDE         107. 4.FMCS  11. 25.0 35.0 28.7  46. 1.154 28.5 1.006   -0. -0.
1.380.80.CLDV B210             75. 4.RMCS   2. 29.0 37.0 32.1  71. 1.176 30.1 1.067   -0. -0.
1.380.80.CLDV 310              85. 4.FMCS   8. 29.0 39.2 32.9  56. 1.104 34.0 0.964   -0. -0.
1.380.78.CLDV B210             85. 4.RMCS   1. 29.0 40.0 33.1  55. 0.943 36.4 0.908   -0. -0.
1.380.80.CLDV B210             85. 4.RMCS   3. 29.0 41.0 33.4  27. 0.979 29.9 1.115   -0. -0.
1.380.80.CLDV B210 W           85. 4.RMCW   1. 29.0 41.0 33.4 100. 1.182 30.6 1.092   -0. -0.
1.380.81.CLDV 310              91. 4.FMCS   1. 30.0 41.0 34.1 100. 1.202 29.1 1.170   -0. -0.
1.380.81.CLDV B210             91. 4.RACS   1. 26.0 34.0 29.1 100. 1.270 24.4 1.193   -0. -0.
1.380.80.CLDV 510             119. 4.RACS   3. 27.0 34.0 29.8  48. 1.155 27.2 1.093   -0. -0.
1.380.80.CLDV 510 W           119. 4.RACW   2. 27.0 32.0 29.0  68. 1.103 24.0 1.209   -0. -0.

1.380.80.CLDV 200SX           119. 4.RAIS   2. 25.0 33.0 28.1  38. 0.985 28.0 1.000   -0. -0.
1.380.81.CLDV 200SX           119. 4.RAIS   1. 26.0 31.0 28.0  50. 1.034 23.3 1.204   -0. -0.
1.380.78.CLDV 510             119. 4.RMCS   1. 24.0 32.0 27.0  75. 1.088 22.5 1.204   -0. -0.
1.380.79.CLDV 510             119. 4.RMCS   1. 23.0 33.0 26.6  50. 1.005 28.4 0.936   -0. -0.
1.380.80.CLDV 510             119. 4.RMCS   4. 30.0 42.0 34.4  83. 1.142 29.4 1.170   -0. -0.
1.380.81.CLDV 510             119. 4.RMCS   1. 28.0 35.0 30.8  75. 1.115 29.7 1.035   -0. -0.
1.380.80.CLDV 510 W           119. 4.RMCW   3. 29.0 38.0 32.5  44. 1.085 32.9 0.986   -0. -0.
1.380.80.CLDV 200SX           119. 4.RMIS  11. 27.0 39.0 31.3  44. 1.106 28.0 1.118   -0. -0.
1.380.80.CLDV 810             146. 6.RAIS   1. 21.0 25.0 22.6  75. 1.093 19.5 1.160 3000. -0.
1.380.80.CLDV 810             146. 6.RMIS   1. 22.0 30.0 25.0  50. 0.966 25.7 0.971 3000. -0.

1.380.80.CLDV 280ZX           168. 6.RAIS   1. 20.0 25.0 22.0   9. 1.197 23.1 0.950   -0. -0.
1.380.80.CLDV 280Z            168. 6.RMIS   1. 20.0 31.0 23.8  50. 1.023 18.6 1.278 3000. -0.
1.380.80.CLDV 280ZX           168. 6.RMIS   9. 20.0 31.0 23.8  56. 1.202 21.2 1.121   -0. -0.
1.380.80.FLDV B210             75. 4.RMCS   1. 31.0 41.0 34.8 100. 1.187 29.3 1.190   -0. -0.
1.380.80.FLDV 310              85. 4.FMCS  34. 31.0 41.3 34.9  51. 1.127 32.7 1.070   -0. -0.
1.380.78.FLDV B210             85. 4.RACS   1. 24.0 28.0 25.6  55. 1.089 22.8 1.125 2250.  2.
1.380.79.FLDV B210             85. 4.RACS   1. 26.0 30.0 27.7  75. 1.088 26.1 1.061   -0. -0.
1.380.75.FLDV B210             85. 4.RMCS   1. 27.0 39.0 31.3  50. 0.923 34.4 0.911 2250. -0.
1.380.76.FLDV B210             85. 4.RMCS   1. 29.0 41.0 33.4  75. 1.032 28.0 1.194 2250. -0.
1.380.78.FLDV B210             85. 4.RMCS   4. 28.0 40.0 32.4  53. 1.010 30.6 1.056 2250.  2.

1.380.79.FLDV B210             85. 4.RMCS   2. 30.5 42.0 34.7  75. 1.096 30.5 1.146 2250. -0.
1.380.80.FLDV B210             85. 4.RMCS  17. 31.0 42.8 35.3  56. 1.199 31.4 1.127   -0. -0.
1.380.79.FLDV B210 W           85. 4.RMCW   1. 28.0 39.0 32.1  75. 1.017 29.3 1.096 2250. -0.
1.380.80.FLDV B210 W           85. 4.RMCW  11. 31.0 43.0 35.4  52. 1.221 31.2 1.136   -0. -0.
1.380.81.FLDV 310              91. 4.FMCS   2. 32.0 42.0 35.8  50. 0.954 33.6 1.066   -0. -0.
1.380.80.FLDV B210             91. 4.RACS   2. 28.0 34.0 30.4  37. 1.177 26.7 1.143   -0. -0.
1.380.81.FLDV B210             91. 4.RACS   2. 29.0 37.0 32.1  38. 1.090 26.9 1.194   -0. -0.
1.380.80.FLDV B210 W           91. 4.RACW   4. 28.0 34.0 30.4  74. 1.164 29.1 1.047 2250. -0.
1.380.80.FLDV B210             91. 4.RMCS   9. 37.0 51.0 42.2  52. 1.128 36.1 1.168   -0. -0.
1.380.81.FLDV B210             91. 4.RMCS   2. 32.0 45.0 36.8  50. 0.966 32.5 1.131   -0. -0.

1.380.78.FLDV 510             119. 4.RACS   2. 25.0 29.0 26.6  50. 1.082 23.1 1.151 2500. -0.
1.380.80.FLDV 510             119. 4.RACS   5. 28.0 35.0 30.8  69. 1.231 24.5 1.258   -0. -0.
1.380.81.FLDV 510             119. 4.RACS   1. 26.0 32.0 28.4  50. 1.090 27.3 1.040   -0. -0.
1.380.80.FLDV 510 W           119. 4.RACW  12. 28.0 35.0 30.8  58. 1.221 25.4 1.209   -0. -0.
1.380.80.FLDV 200SX           119. 4.RAIS   3. 26.0 34.0 29.1  74. 1.122 27.2 1.069   -0. -0.
1.380.78.FLDV 510             119. 4.RMCS   2. 21.5 33.4 27.8  75. 1.067 25.7 1.084 2750. -0.
1.380.79.FLDV 510             119. 4.RMCS   1. 24.0 32.0 27.0  50. 1.089 28.0 0.967 2500. -0.
1.380.80.FLDV 510             119. 4.RMCS  13. 30.6 41.7 34.8  50. 1.123 30.0 1.162   -0. -0.
1.380.81.FLDV 510             119. 4.RMCS   4. 30.0 41.0 34.1  63. 1.099 28.3 1.203   -0. -0.
1.380.79.FLDV 510 W           119. 4.RMCW   1. 23.0 31.0 26.0  50. 0.897 24.1 1.079 2750. -0.
```

```
1.380.80.FLDV 510 W          119. 4.RMCW    9. 30.0 40.0 33.8  67. 1.174 29.7 1.136   -0. -0.
1.380.80.FLDV 200SX          119. 4.RMIS   23. 28.0 40.0 32.4  44. 1.115 31.1 1.042   -0. -0.
1.380.81.FLDV 200SX          119. 4.RMIS    2. 28.0 39.0 32.1  63. 0.997 28.1 1.139   -0. -0.
1.380.77.FLDV 810            146. 6.RAIS    1. 17.0 22.0 18.9 100. 1.494 15.4 1.227 3000. -0.
1.380.80.FLDV 810 W          146. 6.RAIW    2. 21.0 26.0 23.0  16. 1.059 20.4 1.125   -0. -0.
1.380.77.FLDV 810            146. 6.RMIS    1. 17.0 28.0 20.6  75. 0.998 19.8 1.040 3000. -0.
1.380.78.FLDV 810            146. 6.RMIS    1. 16.0 23.0 18.5  50. 0.872 18.8 0.984 3000. -0.
1.380.79.FLDV 810            146. 6.RMIS    1. 20.0 28.0 22.9  50. 0.880 17.5 1.311 3000. -0.
1.380.80.FLDV 280ZX          168. 6.RAIS    2. 19.0 26.0 21.6  13. 1.023 22.3 0.971   -0. -0.
1.380.76.FLDV 280Z           168. 6.RMIS    1. 16.0 27.0 19.6  75. 0.978 21.6 0.907 3000. -0.

1.380.77.FLDV 280Z           168. 6.RMIS    1. 18.0 27.0 21.2  75. 1.077 16.6 1.274 3000. -0.
1.380.79.FLDV 280Z           168. 6.RMIS    2. 18.0 28.0 21.4  63. 1.068 20.3 1.053   -0. -0.
1.380.80.FLDV 280ZX          168. 6.RMIS   16. 21.0 31.0 24.6  44. 1.073 21.4 1.149   -0. -0.
1.410.80.CLDD 505            141. 4.RADS    9. 28.0 31.0 29.3  41. 1.151 26.8 1.093   -0. -0.
1.410.80.CLDD 504 W          141. 4.RADW    3. 28.0 31.0 29.3  46. 1.234 26.8 1.093   -0. -0.
1.410.80.CLDD 505            141. 4.RMDS    3. 28.0 32.0 29.7  65. 1.183 28.8 1.030   -0. -0.
1.410.80.CLDD 504 W          141. 4.RMDW    1. 28.0 32.0 29.7   0. 1.215 32.7 0.908   -0. -0.
1.410.80.CLDV 505            120. 4.RAIS    2. 19.0 24.0 21.0  90. 1.310 18.5 1.133   -0. -0.
1.410.80.CLDV 505            120. 4.RMIS    1. 16.0 24.0 18.8  32. 1.093 22.1 0.852   -0. -0.
1.410.80.FLDD 505            141. 4.RADS   15. 28.0 32.0 29.7  57. 1.137 27.3 1.087   -0. -0.

1.410.80.FLDD 504 W          141. 4.RADW    1. 28.0 32.0 29.7  94. 1.189 25.7 1.154   -0. -0.
1.410.80.FLDD 505            141. 4.RMDS   12. 29.0 35.0 31.4  45. 1.104 29.9 1.049   -0. -0.
1.410.80.FLDD 504 W          141. 4.RMDW    1. 29.0 35.0 31.4  40. 1.098 30.1 1.043   -0. -0.
1.410.80.FLDV 505            120. 4.RAIS    4. 19.0 24.0 21.0  46. 1.244 18.4 1.141   -0. -0.
1.410.80.FLDV 505            120. 4.RMIS    2. 16.0 24.0 18.8  49. 1.219 20.6 0.913   -0. -0.
1.430.79.FLDV LE CAR          79. 4.FMCS    1. 26.0 41.0 31.1  50. 1.016 29.6 1.053 2000. -0.
1.560.80.CLDV RX-7            70. 2.RMCS   11. 16.0 26.7 19.5  52. 1.137 18.4 1.061   -0. -0.
1.560.80.CLDV GLC             86. 4.RACS    5. 25.0 31.0 27.4  41. 1.167 23.4 1.171   -0. -0.
1.560.80.CLDV GLC             86. 4.RMCS   12. 29.7 41.0 33.8  66. 1.199 30.6 1.109   -0. -0.
1.560.81.CLDV GLC             91. 4.FMCS    1. 35.0 43.0 38.2  50. 1.086 31.9 1.198   -0. -0.

1.560.80.CLDV 626            120. 4.RACS    2. 24.0 28.0 25.6  70. 1.181 21.3 1.205   -0. -0.
1.560.79.CLDV 626            120. 4.RMCS    1. 25.0 34.0 28.4  75. 0.977 25.3 1.123   -0. -0.
1.560.80.CLDV 626            120. 4.RMCS    9. 24.0 33.0 27.4  55. 1.177 26.0 1.054   -0. -0.
1.560.81.CLDV 626            120. 4.RMCS    1. 28.0 39.0 32.1  25. 0.874 27.4 1.169   -0. -0.
1.560.80.FLDV RX-7            70. 2.RACS    2. 16.0 24.0 18.8  59. 1.064 18.4 1.022   -0. -0.
1.560.79.FLDV RX-7            70. 2.RMCS    2. 17.0 28.0 20.6  63. 1.057 18.6 1.106 2750. -0.
1.560.80.FLDV RX-7            70. 2.RMCS   17. 17.0 28.0 20.6  56. 1.224 18.8 1.100   -0. -0.
1.560.78.FLDV GLC             78. 4.RMCS    3. 35.0 44.0 38.5  45. 1.040 29.6 1.301 2250.  3.
1.560.80.FLDV GLC             86. 4.RACS    4. 27.0 34.0 29.8  54. 1.197 25.1 1.185   -0. -0.
1.560.80.FLDV GLC             86. 4.RMCS   31. 29.8 41.3 34.1  51. 1.150 30.4 1.122   -0. -0.

1.560.81.FLDV GLC             91. 4.FMCS    3. 35.0 43.6 38.4  75. 1.351 31.7 1.212   -0. -0.
1.560.80.FLDV 626            120. 4.RACS   11. 24.0 28.0 25.6  43. 1.220 21.9 1.168   -0. -0.
1.560.79.FLDV 626            120. 4.RMCS    1. 25.0 34.0 28.4  50. 1.070 25.4 1.117 2750. -0.
1.560.80.FLDV 626            120. 4.RMCS   27. 24.0 33.0 27.4  62. 1.225 24.0 1.140   -0. -0.
1.570.80.CLDV TERCEL          89. 4.FMCS    6. 30.0 41.5 34.2  37. 1.076 31.1 1.104   -0. -0.
1.570.81.CLDV CORONA          89. 4.RMCS    2. 36.0 48.0 40.6  63. 1.099 33.4 1.212   -0. -0.
1.570.80.CLDV COROLLA         97. 4.RACS    2. 23.0 27.0 24.6  20. 1.082 25.6 0.964   -0. -0.
1.570.80.CLDV COROLLA         97. 4.RMCS    3. 23.0 34.9 27.2  46. 1.113 23.4 1.162   -0. -0.
1.570.79.CLDV CORONA          97. 4.RMCS    1. 22.0 32.0 25.6  75. 1.092 22.1 1.159   -0. -0.
1.570.80.CLDV CORONA         108. 4.RACS    1. 23.0 27.0 24.6  50. 1.055 24.8 0.995   -0. -0.

1.570.81.CLDV CORONA         108. 4.RACS    1. 27.0 32.0 29.0  75. 1.114 23.9 1.213   -0. -0.
1.570.80.CLDV CORONA         108. 4.RMCS    1. 23.0 36.0 27.5  75. 1.068 24.2 1.133   -0. -0.
1.570.81.CLDV CORONA         108. 4.RMCS    2. 26.0 37.0 30.0  63. 0.983 22.3 1.347   -0. -0.
1.570.80.CLDV CELICA         134. 4.RACS    1. 18.0 24.0 20.3  12. 1.188 19.2 1.055   -0. -0.
1.570.78.CLDV CORONA         134. 4.RACS    1. 19.0 23.0 20.6  75. 1.086 17.8 1.155   -0. -0.
1.570.79.CLDV CELICA         134. 4.RMCS    1. 19.0 29.0 22.5  50. 0.875 23.0 0.976   -0. -0.
1.570.80.CLDV CELICA         134. 4.RMCS    3. 19.0 29.0 22.5  77. 1.233 20.5 1.096   -0. -0.
1.570.81.CLDV CELICA         144. 4.RACS    1. 23.0 30.0 25.7  75. 1.208 19.9 1.289   -0. -0.
1.570.81.CLDV CORONA         144. 4.RMCS    1. 25.0 37.0 29.3  75. 1.179 20.4 1.436   -0. -0.
1.570.80.CLDV SUPRA          156. 6.RAIS    1. 21.0 26.0 23.0 100. 1.349 18.6 1.233   -0. -0.
```

```
1.570.80.CLDV SUPRA          156. 6.RMIS   2. 19.0 27.0 21.9  50. 1.095 21.2 1.032   -0. -0.
1.570.78.FLDV CORONA          71. 4.RMCS   4. 34.0 46.0 38.5  88. 1.202 30.1 1.280 2250. -0.
1.570.79.FLDV CORONA          71. 4.RMCS   1. 31.0 40.0 34.5  75. 1.175 29.0 1.187 2250. -0.
1.570.80.FLDV TERCEL          89. 4.FACS   4. 29.0 35.0 31.4  85. 1.239 24.6 1.276   -0. -0.
1.570.80.FLDV TERCEL          89. 4.FMCS  26. 31.7 43.0 35.9  56. 1.197 30.5 1.176 2250. -0.
1.570.81.FLDV TERCEL          89. 4.FMCS   4. 34.0 46.0 38.5  31. 0.905 34.4 1.119   -0. -0.
1.570.75.FLDV CORONA          96. 4.RMCS   1. 21.0 33.0 25.1  75. 1.109 19.9 1.262 2500. -0.
1.570.77.FLDV COROLLA         97. 4.RACS   2. 25.0 31.0 27.4  55. 1.052 22.0 1.242 2500.  3.
1.570.80.FLDV COROLLA         97. 4.RACS  11. 26.0 31.0 28.0  58. 1.158 24.6 1.137   -0. -0.
1.570.78.FLDV CORONA          97. 4.RACS   3. 26.0 32.0 28.4  83. 1.019 23.4 1.216 2500. -0.

1.570.79.FLDV CORONA          97. 4.RACS   1. 23.0 30.0 25.7 100. 1.251 22.3 1.155   -0. -0.
1.570.80.FLDV COROLLA         97. 4.RMCS  16. 27.1 40.3 31.8  51. 1.276 27.6 1.151   -0. -0.
1.570.75.FLDV CORONA          97. 4.RMCS   1. 21.0 33.0 25.1 100. 1.225 22.6 1.112 2500. -0.
1.570.76.FLDV CORONA          97. 4.RMCS   1. 24.0 36.0 28.2  75. 1.155 22.9 1.235 2750. -0.
1.570.77.FLDV CORONA          97. 4.RMCS   2. 28.0 39.0 32.1  88. 1.133 22.6 1.419 2500. -0.
1.570.78.FLDV CORONA          97. 4.RMCS   1. 28.0 38.0 31.8  25. 0.972 26.2 1.210 2500. -0.
1.570.79.FLDV CORONA          97. 4.RMCS   1. 24.0 35.0 27.9  50. 0.833 27.5 1.017   -0. -0.
1.570.75.FLDV COROLLA W       97. 4.RMCW   1. 21.0 33.0 25.1  75. 1.138 22.3 1.125 2750. -0.
1.570.80.FLDV CORONA         108. 4.RACS   1. 26.0 31.0 28.0 100. 1.397 21.4 1.307   -0. -0.
1.570.81.FLDV CORONA         108. 4.RACS   1. 27.0 32.0 29.0  75. 1.087 22.8 1.273   -0. -0.

1.570.80.FLDV CORONA         108. 4.RMCS   2. 27.0 41.0 31.9  50. 0.943 29.3 1.091 2500. -0.
1.570.81.FLDV CORONA         108. 4.RMCS   2. 27.5 35.2 30.5  38. 1.097 27.1 1.134   -0. -0.
1.570.76.FLDV CELICA         134. 4.RACS   1. 21.0 31.0 24.6  75. 1.163 20.0 1.225 3000. -0.
1.570.79.FLDV CELICA         134. 4.RACS   3. 18.0 24.0 20.3  83. 1.195 17.3 1.174 3000. -0.
1.570.80.FLDV CELICA         134. 4.RACS   6. 20.0 26.0 22.3  83. 1.264 20.0 1.118   -0. -0.
1.570.79.FLDV CORONA         134. 4.RACS   1. 18.0 24.0 20.3  75. 1.099 19.3 1.050 3000. -0.
1.570.80.FLDV CORONA         134. 4.RACS   4. 20.0 26.0 22.3  28. 1.022 20.1 1.110 2750. -0.
1.570.78.FLDV CORONA W       134. 4.RACW   1. 19.0 23.0 20.6 100. 1.074 17.6 1.170 3000. -0.
1.570.77.FLDV CELICA         134. 4.RMCS   1. 21.0 35.0 25.6 100. 1.263 16.9 1.514 3000. -0.
1.570.78.FLDV CELICA         134. 4.RMCS   1. 20.0 34.0 24.5  50. 1.093 22.1 1.109   -0. -0.

1.570.79.FLDV CELICA         134. 4.RMCS   3. 18.0 29.0 21.7  67. 1.126 18.2 1.196 3000. -0.
1.570.80.FLDV CELICA         134. 4.RMCS  14. 21.1 32.0 24.9  50. 1.104 22.8 1.096   -0. -0.
1.570.79.FLDV CORONA         134. 4.RMCS   1. 18.0 29.0 21.7 100. 1.673 16.3 1.330   -0. -0.
1.570.81.FLDV CELICA         144. 4.RACS   1. 25.0 35.0 28.7  50. 0.976 22.0 1.304   -0. -0.
1.570.81.FLDV CELICA         144. 4.RMCS   1. 25.0 37.0 29.3  75. 0.985 24.2 1.212   -0. -0.
1.570.79.FLDV CRESSIDA       156. 6.RACS   1. 18.0 25.0 20.6  25. 0.878 18.9 1.089   -0. -0.
1.570.80.FLDV SUPRA          156. 6.RAIS   2. 21.0 26.0 23.0  20. 0.848 23.7 0.970   -0. -0.
1.570.80.FLDV SUPRA          156. 6.RMIS   3. 19.0 27.0 21.9  66. 1.051 21.0 1.044   -0. -0.
1.591.80.CLDD DASHER          90. 4.FMDS   1. 36.0 49.0 40.9  26. 1.073 46.2 0.886   -0. -0.
1.591.80.CLDD RABBIT          90. 4.FMDS   7. 40.3 52.5 45.0  47. 1.064 41.4 1.088   -0. -0.

1.591.80.CLDD DASHER W        90. 4.FMDW   1. 36.0 49.0 40.9  19. 1.002 38.9 1.055   -0. -0.
1.591.78.CLDV RABBIT          89. -.FAIS   1. 23.0 32.0 26.3  25. 0.936 24.4 1.080   -0. -0.
1.591.79.CLDV RABBIT          89. 4.FAIS   1. 23.0 32.0 26.3  75. 1.022 23.9 1.104   -0. -0.
1.591.80.CLDV JETTA           97. 4.FAIS   1. 22.0 32.0 25.6  79. 1.228 27.0 0.948   -0. -0.
1.591.80.CLDV RABBIT          97. 4.FAIS   1. 24.0 35.0 27.9  50. 1.424 19.8 1.414   -0. -0.
1.591.80.CLDV DASHER          97. 4.FMIS   1. 24.0 34.0 27.7  25. 1.041 29.2 0.947   -0. -0.
1.591.80.CLDV JETTA           97. 4.FMIS   2. 26.0 40.0 30.9  34. 0.996 31.0 0.997   -0. -0.
1.591.80.CLDV RABBIT          97. 4.FMIS   8. 26.0 38.2 30.4  73. 1.236 28.9 1.051 2250. -0.
1.591.80.CLDV SCIROCCO        97. 4.FMIS   7. 26.0 39.4 30.7  51. 1.114 29.4 1.046 2250. -0.
1.591.80.CLDV 4000            97. 4.FMIS   1. 24.0 35.0 27.9  50. 1.003 19.0 1.474 2500. -0.

1.591.80.CLDV DASHER W        97. 4.FMIW   2. 24.0 34.0 27.7  40. 1.024 26.2 1.056   -0. -0.
1.591.81.CLDV RABBIT         105. 4.FMIS   1. 28.0 42.0 32.9  75. 1.028 30.6 1.076   -0. -0.
1.591.80.CLDV 4000           131. 5.FAIS   1. 20.0 28.0 22.9  19. 1.128 20.8 1.105   -0. -0.
1.591.80.CLDV 5000           131. 5.FAIS   6. 17.3 25.7 20.3  39. 1.072 19.2 1.059 3000. -0.
1.591.80.CLDV 4000           131. 5.FMIS   4. 24.0 35.0 27.9  56. 1.123 25.9 1.079   -0. -0.
1.591.79.FLDD DASHER          90. 4.FMDS   1. 36.0 46.0 39.9  55. 1.076 31.3 1.275 2500.  3.
1.591.77.FLDD RABBIT          90. 4.FMDS   2. 39.0 52.0 43.9  55. 1.076 36.6 1.201 2500.  3.
1.591.78.FLDD RABBIT          90. 4.FMDS   4. 40.0 53.0 45.0  55. 1.076 46.8 0.961 2500.  3.
1.591.79.FLDD RABBIT          90. 4.FMDS   7. 40.0 50.0 44.0  55. 1.077 45.1 0.974 2500.  3.
1.591.80.FLDD RABBIT          90. 4.FMDS  29. 40.1 52.3 44.8  60. 1.099 41.7 1.072 2500.  3.
```

```
1.591.80.FLDD DASHER W          90. 4.FMDW    6. 36.0 49.0 40.9  41. 1.082 40.6 1.007   -0.  -0.
1.591.80.FLDD 5000             121. 5.FMDS   13. 27.0 43.0 32.4  61. 1.077 30.3 1.070   -0.  -0.
1.591.78.FLDV RABBIT            89. 4.FAIS    1. 22.0 32.0 25.6  75. 1.133 23.4 1.093 2250.  -0.
1.591.78.FLDV RABBIT            89. 4.FMIS    1. 26.0 40.0 30.9  55. 1.074 26.7 1.156 2500.   3.
1.591.79.FLDV RABBIT            89. 4.FMIS    5. 25.2 38.7 29.9  55. 1.027 30.9 0.968 2250.  -0.
1.591.80.FLDV RABBIT            89. 4.FMIS    2. 27.0 41.0 31.9  58. 1.159 26.1 1.221   -0.  -0.
1.591.78.FLDV SCIROCCO          89. 4.FMIS    1. 25.0 38.0 29.5  55. 0.963 28.3 1.046 2250.  -0.
1.591.76.FLDV RABBIT            97. 4.FACS    1. 24.0 35.0 27.9  55. 1.074 21.1 1.325 2250.   3.
1.591.78.FLDV DASHER            97. 4.FAIS    1. 20.0 29.0 23.3  50. 1.077 22.4 1.037 2500.  -0.
1.591.80.FLDV DASHER            97. 4.FAIS    1. 22.0 31.0 25.3  54. 1.306 13.8 1.835   -0.  -0.

1.591.80.FLDV JETTA             97. 4.FAIS    4. 22.0 31.0 25.3  43. 1.088 25.0 1.012   -0.  -0.
1.591.77.FLDV RABBIT            97. 4.FAIS    1. 24.0 33.0 27.4  50. 0.866 26.1 1.050 2250.  -0.
1.591.80.FLDV RABBIT            97. 4.FAIS    7. 23.0 32.0 26.3  65. 1.290 23.4 1.125   -0.  -0.
1.591.80.FLDV DASHER W          97. 4.FAIW    1. 22.0 31.0 25.3  46. 1.112 22.5 1.125   -0.  -0.
1.591.76.FLDV RABBIT            97. 4.FMCS    1. 25.0 39.0 29.8 100. 1.196 22.8 1.306 2250.  -0.
1.591.80.FLDV DASHER            97. 4.FMIS    4. 23.0 35.0 27.2  56. 1.070 28.3 0.962   -0.  -0.
1.591.79.FLDV FOX               97. 4.FMIS    1. 23.0 37.0 27.7  75. 1.093 21.7 1.280 2500.  -0.
1.591.80.FLDV JETTA             97. 4.FMIS    7. 25.0 40.0 30.1  56. 1.182 28.1 1.069   -0.  -0.
1.591.77.FLDV RABBIT            97. 4.FMIS    1. 24.0 37.0 28.5  50. 1.012 29.9 0.954 2250.  -0.
1.591.80.FLDV RABBIT            97. 4.FMIS   17. 24.2 38.5 29.1  58. 1.163 27.0 1.079 2250.  -0.

1.591.80.FLDV SCIROCCO          97. 4.FMIS   19. 24.8 39.6 29.8  55. 1.149 28.5 1.044   -0.  -0.
1.591.79.FLDV DASHER W          97. 4.FMIW    1. 23.0 37.0 27.7  25. 0.825 32.1 0.863 2500.  -0.
1.591.80.FLDV DASHER W          97. 4.FMIW    1. 23.0 35.0 27.2  16. 0.897 27.1 1.003   -0.  -0.
1.591.81.FLDV RABBIT           105. 4.FMIS    3. 28.0 42.0 32.9  25. 0.931 33.9 0.971   -0.  -0.
1.591.80.FLDV 4000             131. 5.FAIS    2. 20.0 28.0 22.9  57. 1.184 20.8 1.102   -0.  -0.
1.591.80.FLDV 5000             131. 5.FAIS   21. 17.1 25.0 20.0  56. 1.190 18.6 1.073   -0.  -0.
1.591.80.FLDV 4000             131. 5.FMIS   15. 22.0 34.0 26.1  55. 1.213 27.1 0.965   -0.  -0.
1.591.80.FLDV 5000             131. 5.FMIS    2. 17.0 30.0 21.1  57. 1.198 20.2 1.045   -0.  -0.
1.600.80.CLDV 240              130. 4.RAIS    5. 20.0 26.0 22.3  52. 1.168 20.7 1.077   -0.  -0.
1.600.81.CLDV 240              130. 4.RAIS    1. 19.0 26.0 21.6  25. 0.897 20.2 1.071   -0.  -0.

1.600.80.CLDV 240              130. 4.RMIS    6. 18.0 27.2 21.2  44. 1.143 21.9 0.968   -0.  -0.
1.600.80.CLDV 240 W            130. 4.RMIW    1. 18.0 26.0 20.9  95. 1.545 19.9 1.050   -0.  -0.
1.600.80.CLDV 260              174. 6.RAIS    2. 16.0 21.0 17.9  35. 1.262 19.6 0.916   -0.  -0.
1.600.80.CLDV 260 W            174. 6.RMIW    1. 16.0 27.0 19.6  43. 0.992 16.2 1.209   -0.  -0.
1.600.80.FLDD 240              146. 6.RADS    2. 27.0 32.0 29.0  23. 1.145 26.1 1.110   -0.  -0.
1.600.80.FLDD 260              146. 6.RADS    3. 27.0 32.0 29.0  34. 1.051 28.7 1.012   -0.  -0.
1.600.60.FLDD 260 W            146. 6.RADW    1. 27.0 32.0 29.0  17. 1.057 24.1 1.204   -0.  -0.
1.600.77.FLDV 240              130. 4.RAIS    1. 18.0 24.0 20.3  55. 1.076 18.1 1.120 3000.   4.
1.600.80.FLDV 240              130. 4.RAIS    4. 20.0 26.0 22.3  55. 1.187 20.4 1.095   -0.  -0.
1.600.80.FLDV 260              130. 4.RAIS    2. 20.0 26.0 22.3  43. 0.994 20.8 1.074   -0.  -0.

1.600.80.FLDV 240 W            130. 4.RAIW    1. 19.0 26.0 21.6  80. 1.265 16.0 1.348   -0.  -0.
1.600.80.FLDV 260 W            130. 4.RAIW    1. 19.0 26.0 21.6  91. 1.428 15.6 1.388   -0.  -0.
1.600.80.FLDV 240              130. 4.RMIS   10. 18.0 27.4 21.2  39. 1.023 22.2 0.957   -0.  -0.
1.600.81.FLDV 240              130. 4.RMIS    2. 19.4 29.4 22.9  50. 1.051 20.9 1.105   -0.  -0.
1.600.80.FLDV 260              130. 4.RMIS    2. 18.0 27.5 21.3  47. 1.087 22.5 0.948   -0.  -0.
1.600.80.FLDV 240 W            130. 4.RMIW    2. 18.0 29.0 21.7  20. 0.972 22.7 0.956   -0.  -0.
1.600.79.FLDV 260              163. 6.RAIS    1. 17.0 22.0 18.9  25. 0.801 15.6 1.217 3500.  -0.
1.600.80.FLDV 260              174. 6.RAIS    4. 16.0 21.0 17.9  42. 1.094 17.7 1.014   -0.  -0.
1.600.80.FLDV 260              174. 6.RMIS    2. 16.0 27.0 19.6  31. 1.070 14.9 1.307   -0.  -0.
1.660.81.CLDV SUBARU           109. 4.RMCS    1. 28.0 40.0 32.4  50. 0.955 27.4 1.183   -0.  -0.

1.660.81.FLDV SUBARU            97. 4.RMCS    1. 32.0 43.0 36.2  50. 1.163 34.3 1.055   -0.  -0.
1.660.80.FLDV SUBARU           109. 4.RACS    2. 21.0 30.0 24.3 100. 1.608 18.5 1.316   -0.  -0.
1.660.81.FLDV SUBARU           109. 4.RMCS    2. 26.4 36.2 30.1  50. 1.095 29.6 1.019   -0.  -0.
```

TABLE E-2

LISTING OF MODEL TYPE DATA FOR
FLEET DRIVING - MEASURED ANNUALIZED MPG

80.	10.79.FLDV	CONCORD	121.	4.RACS	30.	20.0	27.0	22.6	55.	1.075	19.6	1.156	3000.	4.
80.	10.78.FLDV	GREMLIN	121.	4.RMCS	2.	22.0	34.0	26.1	55.	1.073	18.5	1.416	3000.	3.
80.	10.80.FLDV	CONCORD	151.	4.RACS	30.	20.0	25.0	22.0	55.	1.077	22.1	0.995	3250.	4.
80.	10.77.FLDV	HORNET	232.	6.RACS	30.	18.0	23.0	19.9	55.	1.023	17.0	1.172	3500.	3.
80.	10.79.FLDV	CONCORD	258.	6.RACS	20.	17.0	23.0	19.3	55.	1.075	15.6	1.233	3000.	4.
80.	10.77.FLDV	MATADOR	258.	6.RACS	1.	15.0	21.0	17.2	55.	1.075	16.1	1.069	4000.	6.
80.	10.76.FLDV	MATADOR	258.	6.RMCS	7.	15.0	19.0	16.6	55.	1.076	13.4	1.233	4000.	6.
80.	10.79.FLDV	CONCORD	304.	8.RACS	4.	15.0	21.0	17.2	55.	1.075	16.3	1.058	3000.	4.
80.	10.77.FLDV	MATADOR	304.	8.RACS	30.	14.0	17.0	15.2	55.	1.077	14.6	1.038	4000.	6.
80.	10.79.FLDV	PACER	304.	8.RACS	5.	14.0	20.0	16.2	55.	1.074	16.0	1.011	4000.	4.
80.	10.78.FLDV	MATADOR	360.	8.RACS	30.	12.0	17.0	13.8	55.	1.129	12.5	1.104	4500.	6.
80.	10.78.FLDV	MATADOR W	360.	8.RACW	4.	12.0	17.0	13.8	55.	1.227	12.3	1.122	4500.	9.
80.	20.79.FLDV	ST REGIS	122.	4.RACS	17.	20.0	27.0	22.6	55.	1.075	21.8	1.040	3000.	3.
80.	20.77.FLDV	ASPEN	225.	6.RACS	30.	18.0	24.0	20.3	55.	1.067	16.7	1.215	3500.	4.
80.	20.78.FLDV	ASPEN	225.	6.RACS	30.	20.0	27.0	22.6	55.	1.075	16.6	1.363	3500.	4.
80.	20.79.FLDV	ASPEN	225.	6.RACS	30.	18.0	24.0	20.3	55.	1.076	19.8	1.024	3500.	5.
80.	20.78.FLDV	FURY	225.	6.RACS	30.	17.0	22.0	18.9	55.	1.076	13.8	1.370	4000.	5.
80.	20.77.FLDV	VOLARE	225.	6.RACS	30.	18.0	24.0	20.3	55.	1.072	17.0	1.193	3500.	4
80.	20.78.FLDV	VOLARE	225.	6.RACS	30.	20.0	27.0	22.6	55.	1.071	18.3	1.235	3500.	4
80.	20.79.FLDV	VOLARE	225.	6.RACS	17.	18.0	24.0	20.3	55.	1.076	18.3	1.107	3500.	5.
80.	20.80.FLDV	VOLARE	225.	6.RACS	30.	17.0	27.0	20.4	55.	1.073	19.4	1.052	3500.	5.
80.	20.77.FLDV	ASPEN	318.	8.RACS	30.	15.0	20.0	16.9	55.	1.058	14.7	1.149	4000.	4.
80.	20.77.FLDV	FURY	318.	8.RACS	30.	13.0	18.0	14.9	55.	1.088	12.7	1.172	4000.	5.
80.	20.77.FLDV	GRAN FURY	318.	8.RACS	9.	13.0	18.0	14.9	55.	1.025	11.5	1.294	4500.	6.
80.	20.79.FLDV	LEBARON	318.	8.RACS	30.	16.0	23.0	18.5	55.	1.075	15.8	1.170	5000.	5.
80.	20.77.FLDV	MONACO	318.	8.RACS	30.	13.0	18.0	14.9	55.	1.077	16.8	0.886	4500.	6.
80.	20.78.FLDV	MONACO	318.	8.RACS	11.	14.0	21.0	16.5	55.	1.064	15.6	1.054	4000.	5.
80.	20.77.FLDV	VOLARE	318.	8.RACS	19.	15.0	20.0	16.9	55.	1.076	14.0	1.204	4000.	4.
80.	20.78.FLDV	VOLARE	318.	8.RACS	8.	15.0	22.0	17.5	55.	1.074	15.0	1.164	4000.	4.
80.	20.79.FLDV	VOLARE	318.	8.RACS	12.	16.0	23.0	18.5	55.	1.075	18.6	0.998	4000.	5.
80.	20.78.FLDV	FURY	360.	8.RACW	30.	13.0	20.0	15.4	55.	1.114	14.6	1.060	5000.	8.
80.	20.78.FLDV	MONACO	360.	8.RACW	1.	13.0	20.0	15.4	55.	1.078	15.1	1.022	4500.	8.
80.	20.77.FLDV	MONACO	400.	8.RACW	18.	10.0	16.0	12.0	55.	1.077	11.4	1.057	5000.	8.
80.	30.78.FLDV	FAIRMONT	140.	4.RACS	30.	22.0	33.0	25.9	55.	1.074	16.7	1.549	3500.	5.
80.	30.76.FLDV	PINTO	140.	4.RACS	3.	22.0	32.0	25.6	55.	1.123	16.3	1.573	3000.	2.
80.	30.78.FLDV	PINTO	140.	4.RACS	8.	21.0	29.0	24.0	55.	1.075	20.7	1.158	3000.	2.
80.	30.79.FLDV	PINTO	140.	4.RACS	4.	21.0	28.0	23.7	55.	1.076	20.6	1.146	3000.	2.
80.	30.80.FLDV	PINTO	140.	4.RACS	6.	22.0	31.0	25.3	55.	1.075	21.4	1.185	3000.	2.
80.	30.78.FLDV	PINTO W	140.	4.RACW	30.	22.0	31.0	25.3	55.	1.075	19.2	1.320	3000.	7.
80.	30.78.FLDV	PINTO	171.	6.RACS	10.	18.0	22.0	19.6	55.	1.077	20.9	0.939	3000.	2.
80.	30.78.FLDV	FAIRMONT	200.	6.RACS	2.	19.0	26.0	21.6	55.	1.198	8.0	2.689	3500.	5.
80.	30.77.FLDV	MAVERICK	200.	6.RACS	11.	18.0	24.0	20.3	55.	1.018	18.3	1.107	3000.	2.
80.	30.77.FLDV	GRANADA	250.	6.RACS	30.	18.0	23.0	19.9	55.	1.076	16.8	1.189	3500.	4.
80.	30.78.FLDV	GRANADA	250.	6.RACS	16.	18.0	26.0	20.9	55.	1.074	17.6	1.186	3500.	4.
80.	30.79.FLDV	GRANADA	250.	6.RACS	12.	17.0	23.0	19.3	55.	1.075	17.6	1.093	3500.	4.
80.	30.77.FLDV	MAVERICK	250.	6.RACS	11.	17.0	22.0	18.9	55.	1.108	12.3	1.543	3500.	2.
80.	30.77.FLDV	MONARCH	250.	6.RACS	7.	18.0	23.0	19.9	55.	1.076	18.1	1.102	3500.	4.
80.	30.78.FLDV	MONARCH	250.	6.RACS	30.	18.0	26.0	20.9	55.	1.074	17.3	1.205	3500.	4.
80.	30.79.FLDV	MONARCH	250.	6.RACS	6.	17.0	23.0	19.3	55.	1.075	19.8	0.974	3500.	4.
80.	30.78.FLDV	FAIRMONT	302.	8.RACS	22.	16.0	23.0	18.5	55.	1.075	16.6	1.119	4000.	5.

```
80. 30.77.FLDV GRANADA         302. 8.RACS   30. 16.0 22.0 18.2  55. 1.075 14.7 1.240 4000.  4.
80. 30.78.FLDV GRANADA         302. 8.RACS    4. 16.0 23.0 18.5  55. 1.075 16.3 1.141 4000.  4.
80. 30.79.FLDV GRANADA         302. 8.RACS   30. 16.0 22.0 18.2  55. 1.075 15.5 1.180 4000.  4.
80. 30.77.FLDV LTD             302. 8.RACS    2. 15.0 19.0 16.6  55. 1.110 10.5 1.578 4500.  6.
80. 30.78.FLDV LTD             302. 8.RACS   30. 15.0 22.0 17.5  55. 1.074 13.0 1.345 4497.  6.
80. 30.77.FLDV LTD II          302. 8.RACS   30. 15.0 19.0 16.6  55. 1.076 13.3 1.245 4500.  5.
80. 30.78.FLDV LTD II          302. 8.RACS   30. 15.0 22.0 17.5  55. 1.074 12.8 1.365 4500.  5.
80. 30.79.FLDV LTD II          302. 8.RACS   30. 14.0 20.0 16.2  55. 1.074 15.3 1.058 4500.  5.
80. 30.77.FLDV MONARCH         302. 8.RACS    1. 16.0 22.0 18.2  55. 1.075 11.6 1.572 3500.  4.
80. 30.78.FLDV MONARCH         302. 8.RACS    1. 16.0 23.0 18.5  55. 1.075 15.9 1.166 3500.  4.

80. 30.77.FLDV THUNDERBIRD     302. 8.RACS   11. 15.0 19.0 16.6  55. 1.076 13.5 1.231 4500.  4.
80. 30.78.FLDV THUNDERBIRD     302. 8.RACS    3. 15.0 22.0 17.5  55. 1.074 16.5 1.064 4500.  5.
80. 30.78.FLDV LTD             351. 8.RACS    1. 14.0 21.0 16.5  55. 1.074 14.9 1.105 4888.  6.
80. 30.77.FLDV LTD II          351. 8.RACS   24. 14.0 20.0 16.2  55. 1.074 15.4 1.053 4500.  5.
80. 30.78.FLDV LTD II          351. 8.RACS   30. 14.0 21.0 16.5  55. 1.080 12.0 1.371 4500.  5.
80. 30.79.FLDV LTD W           351. 8.RACW    1. 13.0 20.0 15.4  55. 1.074 14.0 1.104 5000.  9.
80. 30.77.FLDV TORINO          351. 8.RACW   30. 13.0 19.0 15.1  55. 1.056 12.5 1.217 5000.  7.
80. 30.77.FLDV LTD             400. 8.RACS    1. 13.0 18.0 14.9  55. 1.075 12.1 1.228 5000.  6.
80. 30.77.FLDV LTD II          400. 8.RACS    1. 13.0 18.0 14.9  55. 1.075 12.5 1.189 4500.  5.
80. 30.77.FLDV LTD W           400. 8.RACW    1. 13.0 18.0 14.9  55. 1.075 11.1 1.339 5000.  8.

80. 40.78.FLDD CUTLASS         350. 8.RADS    9. 21.0 30.0 24.3  55. 1.075 20.8 1.165 3750.  5.
80. 40.79.FLDD CUTLASS         350. 8.RADS   11. 24.0 32.0 27.0  55. 1.076 22.9 1.183 3750.  5.
80. 40.79.FLDD SEVILLE         350. 8.RADS    1. 21.0 29.0 24.0  55. 1.075 23.0 1.043 4500.  5.
80. 40.76.FLDV CHEVETTE         98. 4.RACS   30. 26.0 33.0 28.7  55. 1.147 13.6 2.111 2250.  2.
80. 40.77.FLDV CHEVETTE         98. 4.RACS   30. 26.0 36.0 29.7  55. 1.140 15.0 1.986 2250.  2.
80. 40.78.FLDV CHEVETTE         98. 4.RACS   11. 25.0 33.0 28.1  55. 1.100 18.1 1.549 2250.  3.
80. 40.79.FLDV CHEVETTE         98. 4.RACS    1. 25.0 30.0 27.0  55. 1.077 24.1 1.119 2500.  3.
80. 40.80.FLDV CHEVETTE         98. 4.RACS    4. 25.0 30.0 27.0  55. 1.077 30.9 0.873 2500.  3.
80. 40.79.FLDV MONZA           151. 4.RACS    5. 22.0 30.0 25.0  55. 1.075 22.8 1.097 3000.  3.
80. 40.80.FLDV MONZA           151. 4.RACS    3. 24.0 32.0 27.0  55. 1.076 22.7 1.193 3000.  3.

80. 40.78.FLDV CENTURY         196. 6.RACS   30. 18.0 26.0 20.9  55. 1.074 17.6 1.189 4000.  5.
80. 40.79.FLDV CENTURY         196. 6.RACS   30. 20.0 27.0 22.6  55. 1.075 18.3 1.235 4000.  5.
80. 40.78.FLDV MALIBU          200. 6.RACS   30. 19.0 25.0 21.3  55. 1.076 17.4 1.227 4000.  5.
80. 40.79.FLDV MALIBU          200. 6.RACS   30. 18.0 24.0 20.3  55. 1.076 18.0 1.126 4000.  5.
80. 40.79.FLDV MONTE CARLO     200. 6.RACS   24. 18.0 24.0 20.3  55. 1.076 17.7 1.144 3500.  5.
80. 40.77.FLDV LE MANS         229. 6.RACS   13. 17.0 25.0 19.9  55. 1.107 11.8 1.688 4000.  5.
80. 40.78.FLDV LE MANS         229. 6.RACS   13. 19.0 27.0 21.9  55. 1.075 16.3 1.348 4000.  5.
80. 40.77.FLDV CENTURY         231. 6.RACS   13. 17.0 25.0 19.9  55. 1.074 15.2 1.302 4000.  5.
80. 40.77.FLDV CUTLASS         231. 6.RACS   30. 17.0 25.0 19.9  55. 1.074 14.8 1.344 4000.  5.
80. 40.78.FLDV CUTLASS         231. 6.RACS   30. 19.0 27.0 21.9  55. 1.075 17.6 1.246 4000.  5.

80. 40.79.FLDV CUTLASS         231. 6.RACS   30. 19.0 25.0 21.3  55. 1.076 18.3 1.162 4000.  5.
80. 40.78.FLDV DELTA 88        231. 6.RACS    1. 17.0 25.0 19.9  55. 1.074 15.1 1.315 5000.  6.
80. 40.78.FLDV GRAND PRIX      231. 6.RACS   19. 19.0 27.0 21.9  55. 1.075 19.1 1.146 3500.  5.
80. 40.78.FLDV LESABRE         231. 6.RACS    5. 17.0 25.0 19.9  55. 1.074 15.3 1.302 4500.  6.
80. 40.77.FLDV OMEGA           231. 6.RACS   22. 19.0 26.0 21.6  55. 1.075 16.8 1.286 3500.  4.
80. 40.77.FLDV SKYLARK         231. 6.RACS   30. 18.0 25.0 20.6  55. 1.075 17.9 1.149 3500.  3.
80. 40.78.FLDV SKYLARK         231. 6.RACS    1. 18.0 26.0 20.9  55. 1.074 19.3 1.082 3500.  4.
80. 40.77.FLDV VENTURA         231. 6.RACS   30. 18.0 26.0 20.9  55. 1.074 16.6 1.256 3500.  4.
80. 40.78.FLDV SKYHAWK         231. 6.RMCS    1. 16.0 28.0 19.8  55. 1.072 20.7 0.957 3500.  3.
80. 40.78.FLDV IMPALA          250. 6.RACS   14. 17.0 24.0 19.6  55. 1.083 16.4 1.194 4000.  6.

80. 40.77.FLDV MALIBU          250. 6.RACS    1. 17.0 22.0 18.9  55. 1.076 17.6 1.076 4000.  5.
80. 40.77.FLDV NOVA            250. 6.RACS   30. 18.0 23.0 19.9  55. 1.070 16.0 1.251 3500.  3.
80. 40.78.FLDV NOVA            250. 6.RACS   15. 18.0 24.0 20.3  55. 1.085 17.6 1.154 3500.  4.
80. 40.77.FLDV CUTLASS         260. 8.RACS   15. 16.0 21.0 17.9  55. 1.076 15.4 1.162 4000.  5.
80. 40.78.FLDV CUTLASS         260. 8.RACS    2. 19.0 27.0 21.9  55. 1.075 17.0 1.292 4000.  5.
80. 40.77.FLDV OMEGA           260. 8.RACS    5. 17.0 23.0 19.3  55. 1.075 15.2 1.271 4000.  4.
80. 40.77.FLDV LE MANS         301. 8.RACS    2. 16.0 23.0 18.5  55. 1.075 18.0 1.030 4000.  5.
80. 40.77.FLDV LESABRE         301. 8.RACS    1. 17.0 23.0 19.3  55. 1.075 15.0 1.284 4500.  6.
80. 40.77.FLDV SKYLARK         301. 8.RACS   27. 17.0 23.0 19.3  55. 1.075 14.6 1.323 4000.  3.
80. 40.78.FLDV LE MANS W       301. 8.RACW    1. 15.0 21.0 17.2  55. 1.075 14.3 1.203 4500.  9.
```

```
80. 40.79.FLDV CUTLASS          305. 8.RACS   12. 17.0 23.0 19.3  55. 1.075 17.9 1.077 4000.  5.
80. 40.77.FLDV IMPALA           305. 8.RACS   30. 16.0 21.0 17.9  55. 1.076 14.2 1.264 4000.  6.
80. 40.78.FLDV IMPALA           305. 8.RACS   30. 16.0 22.0 18.2  55. 1.075 14.0 1.301 4000.  6.
80. 40.79.FLDV IMPALA           305. 8.RACS   30. 16.0 21.0 17.9  55. 1.076 14.6 1.232 4000.  6.
80. 40.77.FLDV MALIBU           305. 8.RACS   30. 16.0 21.0 17.9  55. 1.024 14.4 1.240 4500.  5.
80. 40.78.FLDV MALIBU           305. 8.RACS   30. 17.0 25.0 19.9  55. 1.074 14.8 1.338 4500.  5.
80. 40.77.FLDV MONTE CARLO      305. 8.RACS    2. 16.0 20.0 17.6  55. 1.076 14.4 1.217 4500.  3.
80. 40.77.FLDV NOVA             305. 8.RACS   10. 16.0 21.0 17.9  55. 1.076 15.3 1.169 3500.  3.
80. 40.78.FLDV IMPALA           305. 8.RACW    5. 14.0 20.0 16.2  55. 1.074 14.6 1.105 4500.  9.
80. 40.79.FLDV IMPALA           305. 8.RACW   17. 14.0 19.0 15.9  55. 1.075 15.0 1.056 4500.  9.

80. 40.78.FLDV MALIBU           305. 8.RACW   30. 16.0 22.0 18.2  55. 1.075 15.1 1.210 4500.  8.
80. 40.78.FLDV CATALINA         350. 8.RACS    1. 15.0 22.0 17.5  55. 1.074 13.7 1.278 4500.  6.
80. 40.77.FLDV CENTURY          350. 8.RACS   14. 15.0 20.0 16.9  55. 1.076 14.4 1.178 4500.  5.
80. 40.77.FLDV CUTLASS          350. 8.RACS   18. 16.0 21.0 17.9  55. 1.076 15.2 1.180 4500.  5.
80. 40.78.FLDV DELTA 88         350. 8.RACS    3. 16.0 23.0 18.5  55. 1.075 15.0 1.239 5000.  6.
80. 40.77.FLDV GRAND PRIX       350. 8.RACS   26. 14.0 21.0 16.5  55. 1.074 14.5 1.138 4500.  4.
80. 40.77.FLDV IMPALA           350. 8.RACS    1. 15.0 20.0 16.9  55. 1.076 13.6 1.243 4500.  6.
80. 40.77.FLDV MALIBU           350. 8.RACS   21. 14.0 19.0 15.9  55. 1.075 14.8 1.072 4000.  5.
80. 40.77.FLDV MONTE CARLO      350. 8.RACS    7. 14.0 19.0 15.9  55. 1.075 14.7 1.080 4500.  3.
80. 40.77.FLDV IMPALA           350. 8.RACW    2. 14.0 19.0 15.9  55. 1.075 14.7 1.081 4500.  8.

80. 40.77.FLDV MALIBU           350. 8.RACW    8. 13.0 17.0 14.5  55. 1.076 15.2 0.959 4500.  8.
80. 40.78.FLDV CATALINA         400. 8.RACS   30. 14.0 19.0 15.9  55. 1.079 10.3 1.541 5000.  6.
80.200.79.FLDD 300D             183. 5.RADS    3. 23.0 28.0 25.0  55. 1.077 26.3 0.952 4500.  4.
80.591.77.FLDD RABBIT            90. 4.FMDS    1. 39.0 52.0 43.9  55. 1.076 38.7 1.136 2500.  3.
80.591.78.FLDD RABBIT            90. 4.FMDS    1. 40.0 53.0 45.0  55. 1.076 40.5 1.110 2500.  3.
80.591.80.FLDD RABBIT            90. 4.FMDS    3. 40.0 52.0 44.6  55. 1.076 40.8 1.094 2500.  3.
```

TABLE E-3

LISTING OF MODEL TYPE DATA FOR

CONSUMER DRIVING - PERCEIVED MPG

90.	10.76.FLDV	HORNET	232.	6.RMCS	1.	17.0	25.0	19.9	55.	1.074	17.6	1.128	3500.	3.
90.	10.76.FLDV	PACER	232.	6.RMCS	1.	17.0	25.0	19.9	55.	1.074	19.5	1.016	3500.	4.
90.	10.77.FLDV	PACER	258.	6.RACS	1.	17.0	23.0	19.3	55.	1.075	17.6	1.096	3500.	4.
90.	20.78.CLDV	HORIZON	105.	4.FACS	2.	21.5	27.8	23.9	45.	1.172	22.9	1.047	-0.	-0.
90.	20.78.CLDV	OMNI	105.	4.FACS	2.	21.5	27.8	23.9	80.	1.360	21.1	1.136	-0.	-0.
90.	20.78.CLDV	OMNI	105.	4.FMCS	1.	24.1	35.3	28.1	25.	1.044	28.0	1.004	-0.	-0.
90.	20.76.FLDV	COLT	98.	4.RACS	1.	24.0	30.0	26.4	55.	1.076	25.4	1.040	2500.	2.
90.	20.76.FLDV	COLT	98.	4.RMCS	9.	24.0	37.0	28.5	55.	1.074	25.4	1.122	2500.	2.
90.	20.77.FLDV	COLT	98.	4.RMCS	1.	29.0	45.0	34.5	55.	1.073	35.2	0.980	2500.	2.
90.	20.78.FLDV	HORIZON	105.	4.FACS	30.	23.5	30.5	26.2	47.	1.242	24.6	1.063	-0.	-0.
90.	20.79.FLDV	HORIZON	105.	4.FACS	30.	23.7	31.6	26.7	46.	1.394	23.4	1.141	-0.	-0.
90.	20.78.FLDV	OMNI	105.	4.FACS	16.	23.5	30.5	26.2	48.	1.302	26.0	1.006	-0.	-0.
90.	20.79.FLDV	OMNI	105.	4.FACS	29.	23.7	31.6	26.7	57.	1.350	25.1	1.063	-0.	-0.
90.	20.78.FLDV	HORIZON	105.	4.FMCS	8.	24.8	38.3	29.4	65.	1.284	27.9	1.055	-0.	-0.
90.	20.79.FLDV	HORIZON	105.	4.FMCS	30.	25.4	37.8	29.8	37.	1.234	28.0	1.067	-0.	-0.
90.	20.78.FLDV	OMNI	105.	4.FMCS	9.	24.8	38.3	29.4	34.	1.064	29.9	0.983	-0.	-0.
90.	20.79.FLDV	OMNI	105.	4.FMCS	28.	25.4	37.8	29.8	46.	1.233	28.5	1.046	-0.	-0.
90.	20.77.FLDV	COLT	122.	4.RMCS	1.	20.0	33.0	24.3	55.	1.073	23.5	1.034	2750.	2.
90.	20.77.FLDV	ASPEN	225.	6.RACS	1.	16.0	21.0	17.5	55.	1.076	15.6	1.147	3500.	4.
90.	20.77.FLDV	VOLARE	225.	6.RACS	16.	16.2	21.3	18.2	55.	1.076	16.7	1.092	3500.	4.
90.	20.77.FLDV	ASPEN	225.	6.RMCS	1.	17.0	24.0	19.6	55.	1.075	22.5	0.871	3500.	4.
90.	20.76.FLDV	DART	225.	6.RMCS	1.	19.0	26.0	21.6	55.	1.075	16.6	1.302	3500.	4.
90.	20.76.FLDV	VALIANT	225.	6.RMCS	1.	19.0	26.0	21.6	55.	1.075	16.6	1.302	3500.	4.
90.	20.76.FLDV	VOLARE	225.	6.RMCW	2.	18.0	30.0	21.9	55.	1.072	18.5	1.182	4000.	8.
90.	20.77.FLDV	MONACO	318.	8.RACS	1.	13.0	18.0	14.9	55.	1.075	17.6	0.845	4000.	5.
90.	20.77.FLDV	FURY	360.	8.RACS	1.	11.0	16.0	12.8	55.	1.074	13.7	0.936	4500.	5.
90.	30.76.FLDV	CAPRI	140.	4.RACS	1.	22.0	31.0	25.3	55.	1.075	21.5	1.177	3000.	2.
90.	30.76.FLDV	MUSTANG	140.	4.RACS	7.	22.0	31.0	25.3	55.	1.075	19.2	1.319	3000.	2.
90.	30.77.FLDV	MUSTANG	140.	4.RACS	2.	21.0	29.0	24.0	55.	1.075	20.5	1.172	3000.	2.
90.	30.76.FLDV	PINTO	140.	4.RACS	11.	22.0	32.0	25.6	55.	1.074	20.3	1.260	3000.	2.
90.	30.77.FLDV	PINTO	140.	4.RACS	15.	23.0	32.0	26.3	55.	1.075	20.1	1.308	3000.	2.
90.	30.76.FLDV	PINTO W	140.	4.RACW	1.	22.0	31.0	25.3	55.	1.075	17.6	1.439	3000.	7.
90.	30.76.FLDV	BOBCAT	140.	4.RMCS	2.	24.0	34.0	27.7	55.	1.075	20.5	1.351	3000.	2.
90.	30.77.FLDV	BOBCAT	140.	4.RMCS	2.	26.0	37.0	30.0	55.	1.075	24.4	1.229	3000.	2.
90.	30.76.FLDV	CAPRI	140.	4.RMCS	1.	18.0	27.0	21.2	55.	1.074	17.6	1.203	3000.	2.
90.	30.76.FLDV	MUSTANG	140.	4.RMCS	4.	24.0	34.0	27.7	55.	1.075	22.7	1.220	3000.	2.
90.	30.77.FLDV	MUSTANG	140.	4.RMCS	3.	23.0	33.0	26.6	55.	1.075	22.8	1.168	3000.	2.
90.	30.76.FLDV	PINTO	140.	4.RMCS	22.	24.0	35.0	27.9	55.	1.074	23.2	1.206	3000.	2.
90.	30.77.FLDV	PINTO	140.	4.RMCS	13.	26.0	37.0	30.0	55.	1.075	23.1	1.298	3000.	2.
90.	30.76.FLDV	PINTO W	140.	4.RMCW	2.	24.0	34.0	27.7	55.	1.075	22.9	1.205	3000.	7.
90.	30.76.FLDV	MUSTANG	171.	6.RACS	9.	17.0	23.0	19.3	55.	1.075	17.4	1.108	3000.	2.
90.	30.77.FLDV	MUSTANG	171.	6.RACS	1.	17.0	23.0	19.3	55.	1.075	17.6	1.096	3000.	2.
90.	30.76.FLDV	PINTO	171.	6.RACS	5.	18.0	25.0	20.6	55.	1.075	17.6	1.171	3000.	2.
90.	30.76.FLDV	MUSTANG	171.	6.RMCS	1.	17.0	25.0	19.9	55.	1.074	25.4	0.781	3000.	2.
90.	30.77.FLDV	MAVERICK	200.	6.RACS	1.	18.0	24.0	20.3	55.	1.076	14.6	1.385	3000.	2.
90.	30.76.FLDV	GRANADA	200.	6.RMCS	1.	22.0	30.0	25.0	55.	1.075	17.6	1.422	3500.	4.
90	30.77.FLDV	MONARCH	250.	6.RMCS	1.	21.0	28.0	23.7	55.	1.076	16.6	1.425	3500.	4.
90.	30.77.FLDV	COUGAR	302.	8.RACS	2.	15.0	19.0	16.6	55.	1.076	13.4	1.238	4500.	5.
90.	30.77.FLDV	GRANADA	302.	8.RACS	15.	16.0	22.0	18.2	55.	1.075	14.7	1.240	4000.	4.
90.	30.77.FLDV	MONARCH	302.	8.RACS	9.	16.0	22.0	18.2	55.	1.075	15.7	1.160	3500.	4.

```
90. 30.77.FLDV THUNDERBIRD      302. 8.RACS    1. 15.0 19.0 16.6  55. 1.076 12.7 1.307 4500.  4.
90. 30.77.FLDV COUGAR           351. 8.RACS    5. 14.0 20.0 16.2  55. 1.074 14.2 1.143 4500.  5.
90. 30.77.FLDV LTD              351. 8.RACS    4. 13.0 19.0 15.1  55. 1.074 12.5 1.211 5000.  6.
90. 30.77.FLDV LTD II           351. 8.RACS    2. 14.0 20.0 16.2  55. 1.074 14.0 1.154 4500.  5.
90. 30.78.FLDV LTD II           351. 8.RACS    1. 14.0 21.0 16.5  55. 1.074 14.7 1.123 4500.  5.
90. 30.77.FLDV THUNDERBIRD      351. 8.RACS    9. 14.0 20.0 16.2  55. 1.074 13.2 1.230 4500.  4.
90. 30.77.FLDV COUGAR           400. 8.RACS    4. 13.0 18.0 14.9  55. 1.075 14.1 1.055 5000.  5.
90. 30.77.FLDV LTD              400. 8.RACS    5. 13.0 18.0 14.9  55. 1.075 15.0 0.989 5000.  6.
90. 30.78.FLDV LTD              400. 8.RACS    1. 13.0 20.0 15.4  55. 1.074 15.6 0.986 5000.  6.
90. 30.77.FLDV MARQUIS          400. 8.RACS    1. 13.0 18.0 14.9  55. 1.075 13.7 1.086 5000.  6.

90. 30.78.FLDV MARQUIS          400. 8.RACS    1. 13.0 20.0 15.4  55. 1.074 21.5 0.717 5000.  6.
90. 30.77.FLDV THUNDERBIRD      400. 8.RACS    8. 13.0 18.0 14.9  55. 1.075 12.8 1.164 4500.  4.
90. 30.77.FLDV LTD W            400. 8.RACW    5. 13.0 18.0 14.9  55. 1.075 13.6 1.091 5000.  8.
90. 30.77.FLDV CONTINENTAL      460. 8.RACS    1. 11.0 16.0 12.8  55. 1.074 11.7 1.091 5500.  6.
90. 30.77.FLDV LTD              460. 8.RACS    1. 11.0 16.0 12.8  55. 1.074  7.8 1.637 5000.  6.
90. 30.77.FLDV MARK             460. 8.RACS    1. 13.0 18.0 14.9  55. 1.075  9.8 1.521 5500.  5.
90. 40.79.CLDD CUTLASS          260. 8.RADS    2. 23.7 32.1 26.9  25. 1.126 18.9 1.417   -0. -0.
90. 40.78.CLDD DELTA 88         350. 8.RADS    2. 21.0 29.9 24.3  60. 1.274 20.0 1.212   -0. -0.
90. 40.78.CLDD SEVILLE          350. 8.RADS    1. 21.0 29.9 24.3  75. 1.185 23.1 1.051   -0. -0.
90. 40.78.CLDD CUST CRUISER W   350. 8.RADW    4. 19.2 26.8 22.0  55. 1.210 21.9 1.003   -0. -0.

90. 40.78.CLDV SEVILLE          350. 8.RAIS    4. 11.7 19.1 14.1  38. 1.144 11.9 1.193   -0. -0.
90. 40.79.CLDV SEVILLE          350. 8.RAIS    1. 13.2 20.2 15.6  25. 0.961 13.0 1.204   -0. -0.
90. 40.78.CLDV ELDORADO         425. 8.FACS    1.  9.6 14.9 11.4  45. 1.060 12.0 0.952   -0. -0.
90. 40.79.FLDD CUTLASS          260. 8.RADS   21. 23.7 32.1 26.9  40. 1.234 19.1 1.410   -0. -0.
90. 40.79.FLDD ELDORADO         350. 8.FADS    2. 21.0 28.9 23.9  60. 1.318 15.8 1.519   -0. -0.
90. 40.79.FLDD TORONADO         350. 8.FADS    2. 21.0 28.9 23.9  35. 1.151 20.0 1.196   -0. -0.
90. 40.78.FLDD CUTLASS          350. 8.RADS    1. 21.0 30.0 24.3  55. 1.075 27.7 0.877 3750.  5.
90. 40.78.FLDD DELTA 88         350. 8.RADS   12. 21.0 29.9 24.3  50. 1.199 23.5 1.033   -0. -0.
90. 40.79.FLDD DELTA 88         350. 8.RADS   25. 21.0 28.9 23.9  34. 1.184 20.3 1.180   -0. -0.
90. 40.79.FLDD DEVILLE          350. 8.RADS    5. 20.1 28.3 23.1  27. 1.195 17.5 1.317   -0. -0.

90. 40.78.FLDD SEVILLE          350. 8.RADS    1. 21.0 29.9 24.3  35. 1.181 14.9 1.630   -0. -0.
90. 40.79.FLDD SEVILLE          350. 8.RADS    1. 21.0 28.9 23.9  15. 1.037 19.0 1.259   -0. -0.
90. 40.78.FLDD 98               350. 8.RADS    2. 21.0 29.9 24.3   5. 0.988 26.1 0.930   -0. -0.
90. 40.79.FLDD 98               350. 8.RADS   19. 21.0 28.9 23.9  47. 1.289 21.7 1.105   -0. -0.
90. 40.79.FLDD CUST CRUISER W   350. 8.RADW    2. 20.1 28.3 23.1  55. 1.162 17.5 1.321   -0. -0.
90. 40.77.FLDV CHEVETTE          85. 4.RACS    5. 25.0 35.0 28.7  55. 1.075 23.8 1.206 2250.  2.
90. 40.77.FLDV CHEVETTE          85. 4.RMCS    3. 28.0 42.0 32.9  55. 1.074 26.7 1.235 2250.  2.
90. 40.76.FLDV MONZA            140. 4.RACS    5. 19.4 28.0 22.5  55. 1.074 22.0 1.023 3000.  2.
90. 40.77.FLDV MONZA            140. 4.RACS    1. 21.0 28.0 23.7  55. 1.076 18.5 1.275 3000.  2.
90. 40.76.FLDV VEGA             140. 4.RACS   11. 19.7 28.0 22.7  55. 1.075 19.1 1.190 2750.  2.

90. 40.77.FLDV VEGA             140. 4.RACS    1. 21.0 28.0 23.7  55. 1.076 23.4 1.010 2750.  2.
90. 40.76.FLDV ASTRE            140. 4.RMCS    1. 22.0 35.0 26.4  55. 1.073 24.5 1.080 3000.  2.
90. 40.76.FLDV MONZA            140. 4.RMCS    3. 22.0 35.0 26.4  55. 1.073 20.5 1.290 3000.  2.
90. 40.77.FLDV MONZA            140. 4.RMCS    2. 24.0 33.0 27.4  55. 1.075 18.1 1.515 3000.  2.
90. 40.76.FLDV VEGA             140. 4.RMCS    6. 22.0 35.0 26.4  55. 1.073 21.2 1.248 2750.  2.
90. 40.79.FLDV RIVIERA          231. 6.FACS    1. 15.8 23.1 18.4  75. 1.403 12.0 1.535   -0. -0.
90. 40.77.FLDV CATALINA         231. 6.RACS    1. 17.0 25.0 19.9  55. 1.074 15.6 1.269 4000.  6.
90. 40.77.FLDV CENTURY          231. 6.RACS    2. 17.0 25.0 19.9  55. 1.074 19.5 1.021 4000.  5.
90. 40.77.FLDV CUTLASS          231. 6.RACS    8. 17.0 25.0 19.9  55. 1.074 17.5 1.132 4000.  5.
90. 40.77.FLDV SKYLARK          231. 6.RACS    1. 18.0 25.0 20.6  55. 1.075 17.6 1.171 3500.  3.

90. 40.77.FLDV STARFIRE         231. 6.RACS    1. 19.0 26.0 21.6  55. 1.075 20.5 1.054 3500.  2.
90. 40.77.FLDV NOVA             250. 6.RACS    9. 18.0 23.0 19.9  55. 1.076 17.6 1.133 3500.  3.
90. 40.78.FLDV NOVA             250. 6.RACS    1. 18.0 24.0 20.3  55. 1.076 13.7 1.484 3500.  4.
90. 40.77.FLDV MALIBU           250. 6.RMCS    1. 18.0 25.0 20.6  55. 1.075 16.6 1.240 4000.  5.
90. 40.77.FLDV NOVA             250. 6.RMCS    1. 19.0 27.0 21.9  55. 1.075 21.5 1.020 3500.  3.
90. 40.77.FLDV CUTLASS          260. 8.RACS    1. 16.0 21.0 17.9  55. 1.076 16.6 1.080 4000.  5.
90. 40.77.FLDV OMEGA            260. 8.RACS    1. 17.0 23.0 19.3  55. 1.075 14.6 1.315 4000.  4.
90. 40.77.FLDV CATALINA         301. 8.RACS    3. 17.0 23.0 19.3  55. 1.075 15.2 1.263 4000.  6.
90. 40.77.FLDV GRAND PRIX       301. 8.RACS    9. 16.0 23.0 18.5  55. 1.075 15.5 1.194 4000.  4.
90. 40.77.FLDV LE MANS          301. 8.RACS    2. 16.0 23.0 18.5  55. 1.075 12.6 1.468 4000.  5.
```

```
90. 40.77.FLDV IMPALA          305. 8.RACS    8. 16.0 21.0 17.9  55. 1.076 16.3 1.099 4000.  6.
90. 40.77.FLDV MALIBU          305. 8.RACS    7. 16.0 21.0 17.9  55. 1.076 16.1 1.110 4500.  5.
90. 40.77.FLDV MONTE CARLO     305. 8.RACS    6. 16.0 20.0 17.6  55. 1.076 13.7 1.282 4500.  3.
90. 40.78.FLDV MONTE CARLO     305. 8.RACS    1. 17.0 25.0 19.9  55. 1.074 19.5 1.016 4500.  5.
90. 40.77.FLDV NOVA            305. 8.RACS    1. 16.0 21.0 17.9  55. 1.076 15.6 1.147 3500.  3.
90. 40.79.FLDV RIVIERA         350. 8.FACS    8. 15.9 21.7 18.1  45. 1.247 15.2 1.187   -0. -0.
90. 40.79.FLDV TORONADO        350. 8.FACS    9. 15.9 21.7 18.1  57. 1.315 15.5 1.166   -0. -0.
90. 40.79.FLDV ELDORADO        350. 8.FAIS   11. 14.1 21.8 16.8  39. 1.320 14.1 1.185   -0. -0.
90. 40.77.FLDV CUTLASS         350. 8.RACS   22. 16.0 21.0 17.9  55. 1.076 15.3 1.171 4500.  5.
90. 40.77.FLDV DELTA 88        350. 8.RACS    1. 16.0 22.0 18.2  55. 1.075 12.7 1.437 5000.  6.

90. 40.78.FLDV DELTA 88        350. 8.RACS    1. 16.0 23.0 18.5  55. 1.075 13.7 1.355 5000.  6.
90. 40.77.FLDV FIREBIRD        350. 8.RACS    1. 16.0 22.0 18.2  55. 1.075 14.6 1.245 4000.  2.
90. 40.77.FLDV GRAND PRIX      350. 8.RACS    1. 14.0 21.0 16.5  55. 1.074 14.7 1.123 4500.  4.
90. 40.77.FLDV IMPALA          350. 8.RACS   16. 15.0 20.0 16.9  55. 1.076 14.1 1.197 4500.  6.
90. 40.77.FLDV MALIBU          350. 8.RACS    3. 14.0 19.0 15.9  55. 1.075 18.5 0.856 4000.  5.
90. 40.77.FLDV MONTE CARLO     350. 8.RACS    6. 14.0 19.0 15.9  55. 1.075 14.9 1.066 4500.  3.
90. 40.76.FLDV SEVILLE         350. 8.RAIS   14. 15.0 21.0 17.2  55. 1.075 15.0 1.143 4500.  3.
90. 40.77.FLDV SEVILLE         350. 8.RAIS    6. 14.0 19.0 15.9  55. 1.075 14.2 1.113 4500.  3.
90. 40.78.FLDV SEVILLE         350. 8.RAIS   10. 13.6 19.9 15.9  62. 1.249 13.9 1.145   -0. -0.
90. 40.79.FLDV SEVILLE         350. 8.RAIS   12. 13.6 19.1 15.6  60. 1.280 13.6 1.145   -0. -0.

90. 40.77.FLDV GRAND PRIX      400. 8.RACS    1. 14.0 21.0 16.5  55. 1.074 13.7 1.203 4500.  4.
90. 40.77.FLDV RIVIERA         403. 8.FACS    6. 15.0 21.0 17.2  55. 1.075 16.2 1.063 4500.  6.
90. 40.78.FLDV TORONADO        403. 8.FACS    9. 13.3 18.7 15.3  41. 1.125 14.6 1.046   -0. -0.
90. 40.77.FLDV DELTA 88        403. 8.RACS    2. 15.0 21.0 17.2  55. 1.075 16.6 1.036 4000.  6.
90. 40.77.FLDV ELECTRA         403. 8.RACS    6. 15.0 21.0 17.2  55. 1.075 15.0 1.144 4500.  6.
90. 40.77.FLDV 98              403. 8.RACS    2. 15.0 21.0 17.2  55. 1.075 16.1 1.068 4500.  6.
90. 40.78.FLDV ELDORADO        425. 8.FACS    5.  9.5 15.2 11.5  10. 0.967 14.8 0.776   -0. -0.
90. 40.77.FLDV DEVILLE         425. 8.RACS    5. 14.0 18.0 15.6  55. 1.076 11.3 1.383 5000.  6.
90. 40.78.FLDV DEVILLE         425. 8.RACS    1. 13.0 19.0 15.1  55. 1.074 10.8 1.408 5000.  6.
90. 40.76.FLDV RIVIERA         455. 8.FACS    3. 12.0 18.0 14.1  55. 1.074 14.5 0.972 5000.  6.

90. 40.76.FLDV ELDORADO        500. 8.FACS    1. 12.0 16.0 13.5  55. 1.076 11.7 1.154 5500.  5.
90. 90.78.CLDV ALFA SPIDER     120. 4.RMIS    1. 17.6 26.1 20.6  45. 1.039 27.1 0.762   -0. -0.
90.200.78.CLDV 450             275. 8.RAIS    1. 11.9 17.8 14.0  45. 1.693 15.0 0.931   -0. -0.
90.200.78.FLDD 300D            183. 5.RADS    4. 22.3 28.2 24.6  60. 1.133 25.6 0.963   -0. -0.
90.200.79.FLDD 300D            183. 5.RADS    3. 24.0 29.1 26.0  42. 1.194 25.6 1.019   -0. -0.
90.200.79.FLDV 450             275. 8.RAIS    3. 12.1 18.5 14.3  38. 1.201 13.3 1.078   -0. -0.
90.231.76.FLDV 128              79. 4.FMCS    1. 20.0 32.0 24.1  55. 1.073 31.3 0.768 2250.  2.
90.231.78.FLDV 128              79. 4.FMCS    3. 19.6 30.7 23.4  61. 1.346 21.9 1.070   -0. -0.
90.231.76.FLDV 131             107. 4.RACS    1. 18.0 24.0 20.3  55. 1.076 22.4 0.903 2750.  3.
90.260.78.CLDV CIVIC            91. 4.FACS    1. 27.9 34.3 30.4   5. 1.105 26.0 1.171   -0. -0.

90.260.78.CLDV CIVIC            91. 4.FMCS   16. 32.6 40.6 35.8  44. 1.209 29.1 1.229   -0. -0.
90.260.78.CLDV ACCORD           98. 4.FACS    6. 24.0 29.6 26.2  52. 1.234 23.1 1.138   -0. -0.
90.260.78.CLDV ACCORD           98. 4.FMCS   13. 30.6 41.8 34.8  43. 1.129 29.7 1.173   -0. -0.
90.260.76.FLDV CIVIC            76. 4.FMCS   15. 28.0 41.0 32.7  55. 1.074 29.1 1.123 2000.  2.
90.260.77.FLDV CIVIC            76. 4.FMCS    8. 28.0 43.0 33.2  55. 1.073 26.9 1.232 2000.  2.
90.260.78.FLDV CIVIC            91. 4.FACS    1. 29.4 34.9 31.6  15. 1.231 29.0 1.092   -0. -0.
90.260.76.FLDV CIVIC            91. 4.FMCS    9. 32.0 43.0 36.2  55. 1.075 30.8 1.174 2000.  2.
90.260.77.FLDV CIVIC            91. 4.FMCS    3. 40.0 52.0 44.6  55. 1.076 30.4 1.469 2000.  2.
90.260.78.FLDV CIVIC            91. 4.FMCS   12. 36.5 44.4 39.7  60. 1.265 30.0 1.322   -0. -0.
90.260.76.FLDV CIVIC            91. 4.FMCW    4. 26.0 37.0 30.0  55. 1.075 29.0 1.034 2250.  7.

90.260.77.FLDV CIVIC            91. 4.FMCW    2. 30.0 41.0 34.1  55. 1.075 27.8 1.229 2250.  7.
90.260.78.FLDV ACCORD           98. 4.FACS   11. 27.6 33.2 29.9  47. 1.240 26.2 1.142   -0. -0.
90.260.77.FLDV ACCORD           98. 4.FMCS    3. 38.0 48.0 41.9  55. 1.076 30.5 1.377 2250.  3.
90.260.78.FLDV ACCORD           98. 4.FMCS   30. 33.2 43.6 37.2  47. 1.172 30.6 1.214   -0. -0.
90.260.79.FLDV ACCORD          107. 4.FMCS    3. 25.9 34.7 29.2  62. 1.289 24.3 1.205   -0. -0.
90.380.78.CLDV 810             146. 6.RAIS    3. 17.5 22.0 19.3  48. 1.235 16.4 1.176   -0. -0.
90.380.78.CLDV 810             146. 6.RMIS    1. 17.6 23.5 19.8  75. 1.331 18.0 1.102   -0. -0.
90.380.78.CLDV 280Z            168. 6.RMIS    6. 18.1 25.8 20.9  45. 1.110 19.3 1.082   -0. -0.
90.380.79.CLDV 280ZX           168. 6.RMIS    1. 17.1 27.2 20.5   5. 1.005 23.0 0.893   -0. -0.
90.380.76.FLDV F10              85. 4.FMCS    1. 29.0 41.0 33.4  55. 1.075 14.6 2.280 2250.  2.
```

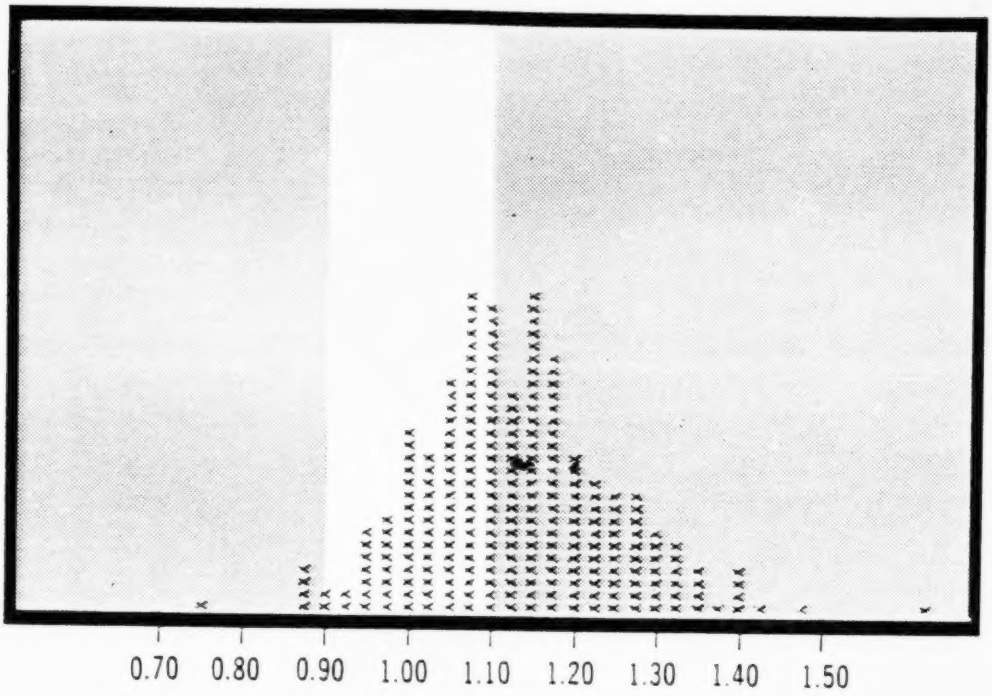
```
90.380.77.FLDV F10              85. 4.FMCS    2. 29.0 41.0 33.4  55. 1.075 22.1 1.511 2250.  2.
90.380.76.FLDV B210             85. 4.RACS    5. 26.0 34.0 29.1  55. 1.076 24.1 1.205 2250.  2.
90.380.77.FLDV B210             85. 4.RACS    3. 26.0 33.0 28.7  55. 1.076 24.0 1.197 2250.  2.
90.380.76.FLDV B210             85. 4.RMCS    8. 29.0 41.0 33.4  55. 1.075 21.7 1.535 2250.  2.
90.380.77.FLDV B210             85. 4.RMCS   18. 30.1 42.3 34.6  55. 1.075 24.1 1.497 2250.  2.
90.380.78.FLDV B210             85. 4.RMCS    1. 36.0 48.0 40.6  55. 1.076 27.3 1.484 2250.  2.
90.380.76.FLDV 610             119. 4.RACS    1. 23.0 29.0 25.4  55. 1.076 19.5 1.300 2750.  2.
90.380.76.FLDV 710             119. 4.RACS    1. 23.0 29.0 25.4  55. 1.076 19.5 1.300 2750.  2.
90.380.76.FLDV 710             119. 4.RMCS    3. 23.0 33.0 26.6  55. 1.075 11.7 2.270 2750.  2.
90.380.77.FLDV 710             119. 4.RMCS    2. 23.0 34.0 26.9  55. 1.074 12.1 2.234 2750.  2.

90.380.78.FLDV 810             146. 6.RAIS    8. 17.0 21.3 18.7  32. 1.078 19.1 0.982   -0. -0.
90.380.78.FLDV 810             146. 6.RMIS    4. 15.9 22.7 18.4  70. 1.368 17.8 1.031   -0. -0.
90.380.78.FLDV 280Z            168. 6.RAIS    1. 17.1 22.7 19.2  75. 1.228 25.0 0.770   -0. -0.
90.380.79.FLDV 280ZX           168. 6.RAIS    1. 16.2 22.3 18.5  95. 1.580 15.0 1.233   -0. -0.
90.380.78.FLDV 280Z            168. 6.RMIS   18. 17.9 27.0 21.1  60. 1.275 20.4 1.035   -0. -0.
90.380.78.FLDV 280ZX           168. 6.RMIS    2. 17.9 27.0 21.1   5. 1.079 28.9 0.731   -0. -0.
90.380.79.FLDV 280ZX           168. 6.RMIS    6. 17.6 28.1 21.2  70. 1.263 20.7 1.022   -0. -0.
90.410.78.CLDD 504 D           141. 4.RADS    1. 25.4 31.0 27.6  75. 1.366 29.3 0.943   -0. -0.
90.410.78.FLDD 504 D           141. 4.RADS    3. 25.4 31.0 27.6  22. 1.155 29.8 0.928   -0. -0.
90.430.78.CLDV LE CAR           79. 4.FMCS    1. 25.2 36.8 29.4  75. 1.146 30.0 0.979   -0. -0.

90.430.78.FLDV LE CAR           79. 4.FMCS    3. 26.0 41.1 31.2  48. 1.120 29.8 1.047   -0. -0.
90.470.78.CLDV 99              122. 4.FMIS    1. 21.8 29.3 24.6  75. 1.219 24.4 1.007   -0. -0.
90.470.78.FLDV 99              122. 4.FMIS    1. 19.5 28.5 22.7  35. 1.243 18.3 1.241   -0. -0.
90.570.77.FLDV COROLLA          71. 4.RMCS    1. 36.0 49.0 40.9  55. 1.075 32.2 1.268 2250.  3.
90.570.76.FLDV COROLLA          97. 4.RACS    5. 24.0 31.0 26.7  55. 1.076 22.8 1.174 2500.  3.
90.570.76.FLDV COROLLA          97. 4.RMCS   19. 24.0 36.0 28.2  55. 1.074 25.5 1.107 2500.  3.
90.570.77.FLDV COROLLA          97. 4.RMCS    4. 28.0 39.0 32.1  55. 1.075 24.9 1.287 2500.  3.
90.570.76.FLDV COROLLA          97. 4.RMCW    5. 24.0 36.0 28.2  55. 1.074 25.6 1.101 2500.  7.
90.570.76.FLDV CELICA          134. 4.RACS    1. 21.0 31.0 24.6  55. 1.074 22.5 1.092 2750.  3.
90.570.76.FLDV CORONA          134. 4.RACS    1. 21.0 31.0 24.6  55. 1.074 21.5 1.142 2576.  3.

90.570.76.FLDV CORONA          134. 4.RACW    1. 21.0 31.0 24.6  55. 1.074 20.5 1.197 3000.  7.
90.570.76.FLDV CELICA          134. 4.RMCS    6. 20.0 34.0 24.5  55. 1.072 22.1 1.113 2750.  3.
90.570.77.FLDV CELICA          134. 4.RMCS   23. 21.0 35.0 25.6  55. 1.073 24.1 1.064 2750.  3.
90.570.76.FLDV CORONA          134. 4.RMCS   10. 20.0 34.0 24.5  55. 1.072 21.3 1.152 2576.  3.
90.591.78.CLDD DASHER           90. 4.FMDS    1. 35.3 47.1 39.8  85. 2.524 25.6 1.552   -0. -0.
90.591.78.CLDD RABBIT           90. 4.FMDS    8. 39.7 52.9 44.7  44. 1.133 44.2 1.012   -0. -0.
90.591.78.CLDV RABBIT           89. 4.FAIS    2. 23.2 32.2 26.5  15. 1.028 28.8 0.922   -0. -0.
90.591.78.CLDV RABBIT           89. 4.FMIS   11. 24.0 36.3 28.3  50. 1.207 30.5 0.930   -0. -0.
90.591.79.CLDV RABBIT           89. 4.FMIS    1. 23.9 41.5 29.5  25. 1.074 30.0 0.985   -0. -0.
90.591.78.CLDV SCIROCCO         89. 4.FMIS    5. 24.0 36.3 28.3  31. 0.992 29.2 0.970   -0. -0.

90.591.78.CLDV FOX              97. 4.FAIS    1. 22.1 29.9 25.0  45. 1.044 20.0 1.252   -0. -0.
90.591.78.CLDV DASHER           97. 4.FMIS    1. 22.2 35.2 26.6  85. 2.633 25.6 1.038   -0. -0.
90.591.78.CLDV FOX              97. 4.FMIS    2. 22.2 35.2 26.6  75. 1.177 23.4 1.137   -0. -0.
90.591.78.CLDV 924             121. 4.RAIS    1. 17.0 25.7 20.1  95. 1.115 22.4 0.896   -0. -0.
90.591.78.CLDV 924             121. 4.RMIS    2. 17.1 25.7 20.1  60. 1.162 20.9 0.964   -0. -0.
90.591.78.CLDV 5000            131. 5.FAIS    3. 15.7 22.5 18.2  58. 1.225 22.1 0.821   -0. -0.
90.591.78.FLDD DASHER           90. 4.FMDS    1. 35.3 47.1 39.8  75. 1.236 28.6 1.389   -0. -0.
90.591.79.FLDD DASHER           90. 4.FMDS    1. 36.3 46.3 40.2  45. 1.343 44.0 0.914   -0. -0.
90.591.78.FLDD RABBIT           90. 4.FMDS   30. 39.7 52.9 44.7  39. 1.144 44.7 1.000   -0. -0.
90.591.79.FLDD RABBIT           90. 4.FMDS   26. 39.9 50.6 44.1  32. 1.233 36.3 1.214   -0. -0.

90.591.78.FLDV RABBIT           89. 4.FAIS    5. 22.1 31.8 25.6  37. 1.112 26.7 0.960   -0. -0.
90.591.78.FLDV RABBIT           89. 4.FMIS   31. 24.9 37.8 29.4  45. 1.194 30.9 0.951 2500.  3.
90.591.79.FLDV RABBIT           89. 4.FMIS   30. 25.0 38.4 29.6  44. 1.253 27.3 1.084   -0. -0.
90.591.78.FLDV SCIROCCO         89. 4.FMIS    4. 24.8 37.6 29.3  43. 1.196 32.1 0.913   -0. -0.
90.591.76.FLDV RABBIT           97. 4.FACS    1. 24.0 35.0 27.9  55. 1.074 24.4 1.144 2250.  3.
90.591.76.FLDV DASHER           97. 4.FAIS    1. 25.0 33.0 28.1  55. 1.076 29.3 0.958 2500.  3.
90.591.78.FLDV DASHER           97. 4.FAIS    4  20.2 29.2 23.4  43. 1.224 21.3 1.102   -0. -0.
90.591.78.FLDV FOX              97. 4.FAIS    3. 20.2 29.2 23.4  88. 1.416 24.6 0.955   -0. -0.
90.591.79.FLDV FOX              97. 4.FAIS    2. 20.2 29.2 23.4  65. 1.893 23.4 1.002   -0. -0.
90.591.76.FLDV RABBIT           97. 4.FMCS    8. 25.0 39.0 29.8  55. 1.074 23.5 1.267 2250.  3.
```

```
90.591.76.FLDV SCIROCCO        97. 4.FMCS   2. 25.0 39.0 29.8  55. 1.074 25.9 1.150 2250.  3.
90.591.78.FLDV DASHER          97. 4.FMIS   3. 23.3 37.2 28.0  62. 1.228 21.0 1.333   -0. -0.
90.591.77.FLDV FOX             97. 4.FMIS   1. 24.0 36.0 28.2  55. 1.074 29.3 0.963 2250.  3.
90.591.78.FLDV FOX             97. 4.FMIS   4. 23.3 37.2 28.0  60. 1.209 28.7 0.976   -0. -0.
90.591.79.FLDV FOX             97. 4.FMIS   6. 23.3 37.2 28.0  62. 1.261 23.4 1.197   -0. -0.
90.591.77.FLDV RABBIT          97. 4.FMIS   6. 24.0 37.0 28.5  55. 1.074 26.6 1.073 2250.  3.
90.591.77.FLDV SCIROCCO        97. 4.FMIS   1. 24.0 37.0 28.5  55. 1.074 21.5 1.325 2250.  3.
90.591.79.FLDV SCIROCCO        97. 4.FMIS   2. 24.5 38.5 29.3  45. 1.304 28.0 1.045   -0. -0.
90.591.76.FLDV BEETLE          97. 4.RMIS   6. 22.0 34.0 26.1  55. 1.073 23.7 1.103 2250.  2.
90.591.78.FLDV 924            121. 4.RAIS   1. 18.6 26.3 21.4  54. 1.112 17.6 1.215   -0. -0.

90.591.78.FLDV 924            121. 4.RMIS   4. 19.9 30.0 23.4  18. 1.032 26.1 0.899   -0. -0.
90.591.78.FLDV 5000           131. 5.FAIS   6. 16.8 23.7 19.3  60. 1.244 19.4 0.998   -0. -0.
90.591.79.FLDV 5000           131. 5.FAIS   2. 17.1 23.7 19.5  30. 1.242 21.4 0.913   -0. -0.
90.591.78.FLDV 5000           131. 5.FMIS   1. 14.8 22.4 17.5  15. 0.991 23.2 0.754   -0. -0.
90.591.78.FLDV 928            273. 8.RMIS   1. 11.9 18.7 14.2  25. 0.978 16.4 0.867   -0. -0.
90.600.76.FLDV 240            130. 4.RMIS   9. 17.0 27.0 20.4  55. 1.073 19.2 1.061 3000.  4.
90.600.76.FLDV 240 W          130. 4.RMIW   9. 16.0 28.0 19.8  55. 1.072 19.3 1.026 3500.  8.
90.600.77.FLDV 240 W          130. 4.RMIW   1. 18.0 30.0 21.9  55. 1.072 19.6 1.120 3500.  8.
90.600.78.FLDV 260            163. 6.RAIS   3. 16.4 22.4 18.6  55. 1.352 18.0 1.035   -0. -0.
90.600.78.FLDV 260            163. 6.RMIS   1. 15.3 26.7 19.0  25. 1.160 20.9 0.909   -0. -0.

90:660.78.CLDV SUBARU          97. 4.FACS   1. 21.5 27.9 24.0  85. 1.279 31.1 0.771   -0. -0.
90.660.78.CLDV SUBARU W        97. 4.FMCW   1. 21.2 32.6 25.1  54. 1.004 30.3 0.829   -0. -0.
90.660.78.FLDV SUBARU          97  4.FACS   1. 25.9 33.1 28.7  95. 1.114 25.4 1.133   -0. -0.
90.660.78.FLDV SUBARU W        97. 4.FACW   1. 24.9 32.5 27.8   5. 1.062 29.7 0.937   -0. -0.
90.660.77.FLDV SUBARU          97  4.FMCS   1. 28.0 41.0 32.7  55. 1.074 27.4 1.193 2500.  2.
90.660.78.FLDV SUBARU          97  4.FMCS   2. 31.5 45.8 36.6  20. 0.995 35.8 1.022   -0. -0.
90.660.78.FLDV SUBARU W        97  4.FMCW   9. 27.2 37.5 31.0  31. 1.208 28.4 1.090   -0. -0.
90.660.79.FLDV SUBARU W        97. 4.FMCW   1. 25.9 37.3 30.0   5. 1.078 21.0 1.430   -0. -0.
```

This page intentionally
blank and un-numbered

APPENDIX F

HISTOGRAMS OF LABEL ERROR



Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Overall**

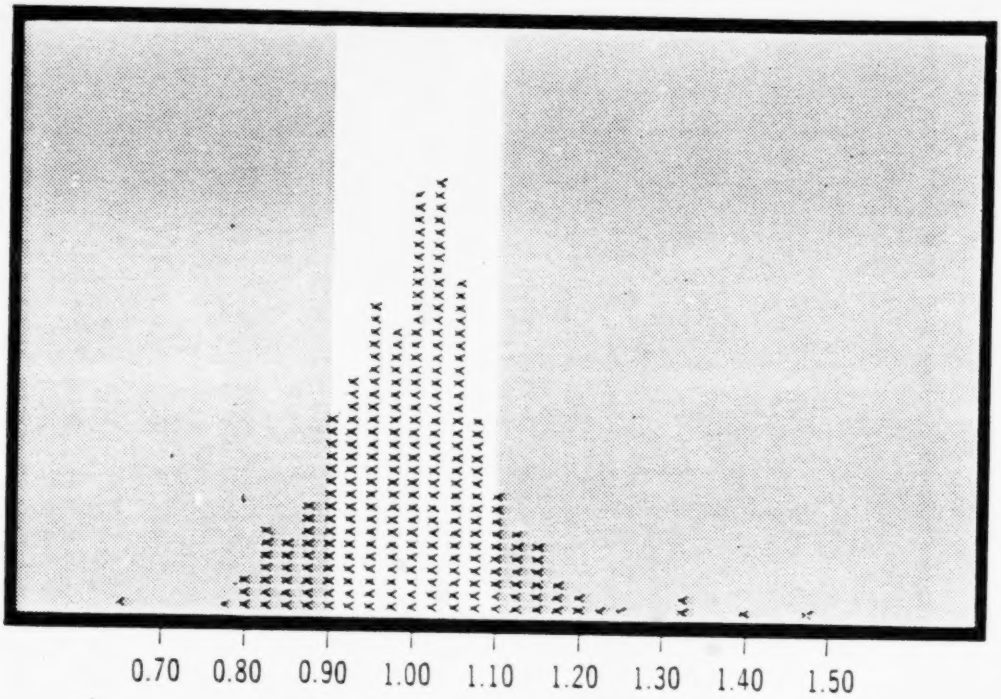
Tech/Ncyl Mix **1985**

Data .... **Model Type**

Vehicles **1,032**

Adjustment: .... **Current System**

Algorithm: .... **Lo=Eo**

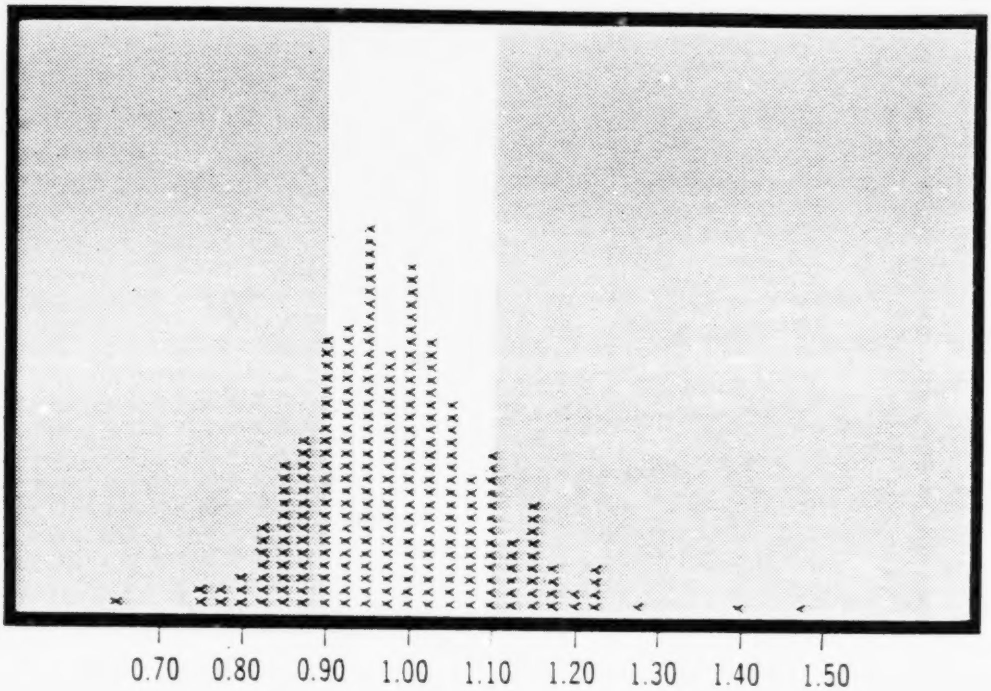


Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Overall**
Tech/Ncyl Mix **1985**
Data .... **Model Type**
Vehicles **1,032**

Adjustment: ....**Non-Modal Formula**

Algorithm: .... **Lo=OM (Eo)**

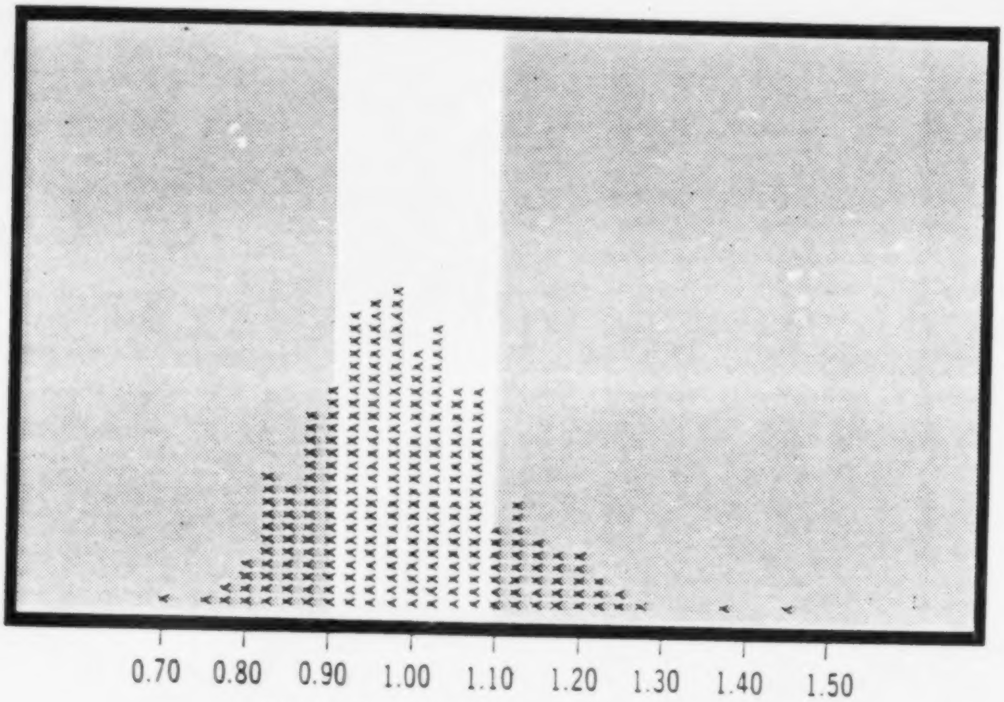


Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Overall**
Tech/Ncyl Mix **1985**
Data .... **Model Type**
Vehicles **1,032**

Adjustment: .... **Non-Modal Factor**

Algorithm: .... **Lo=0.86×Eo**

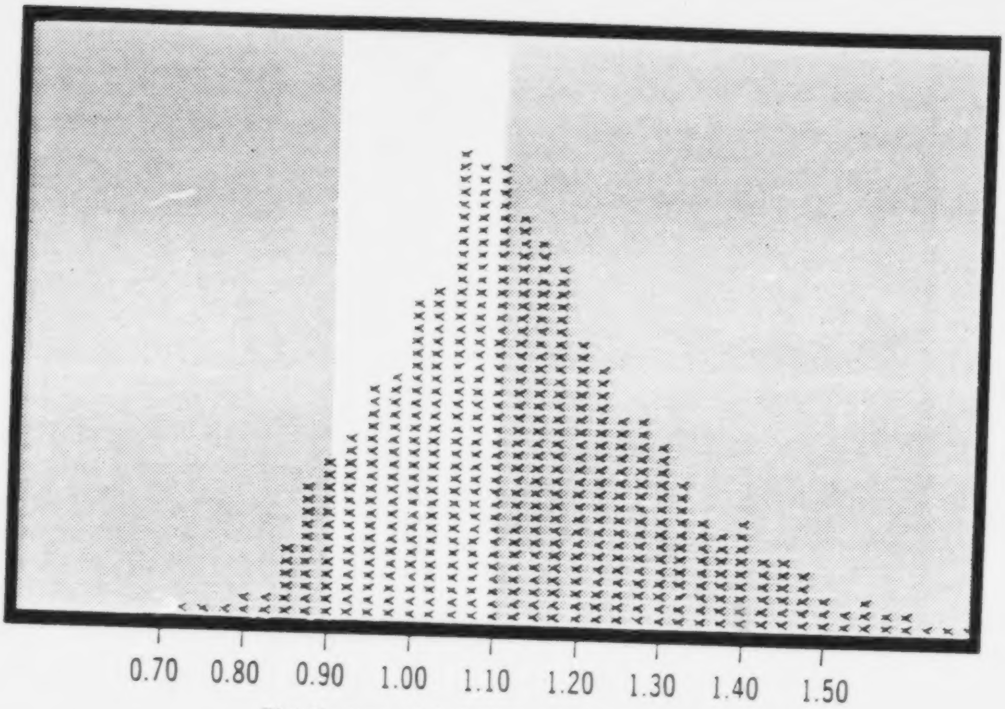


Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Overall**
Tech/Ncyl Mix **1985**
Data ....**Model Type**
Vehicles **1,032**

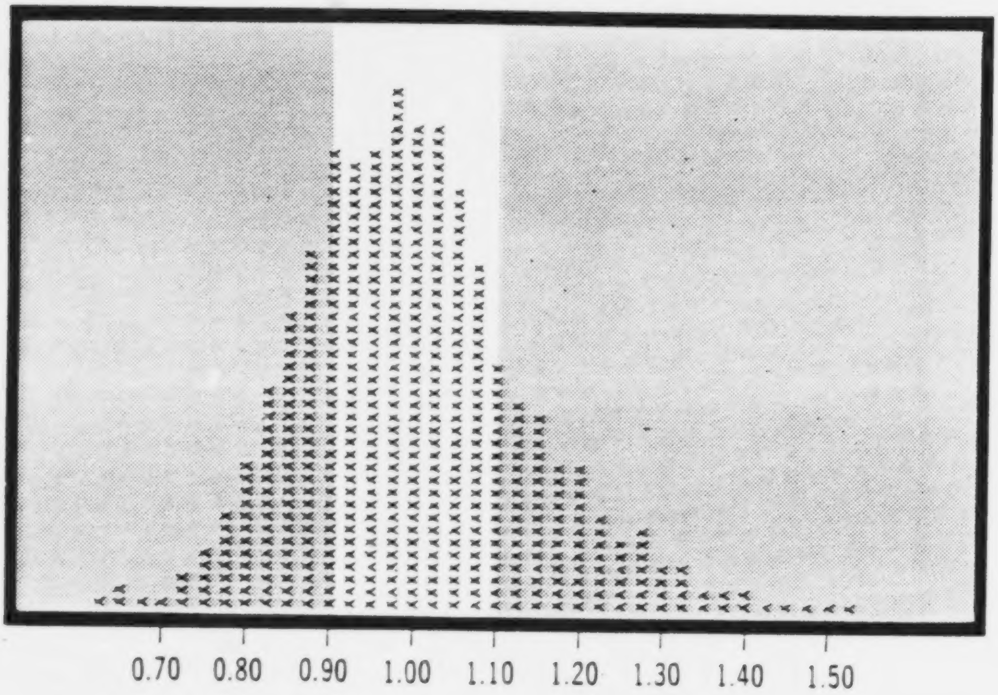
Adjustment: .... **City Number**

Algorithm: .... **Lo - Ec**



Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Overall**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**10,347**
Adjustment:		**Current System**
Algorithm:		**Lo-Eo**

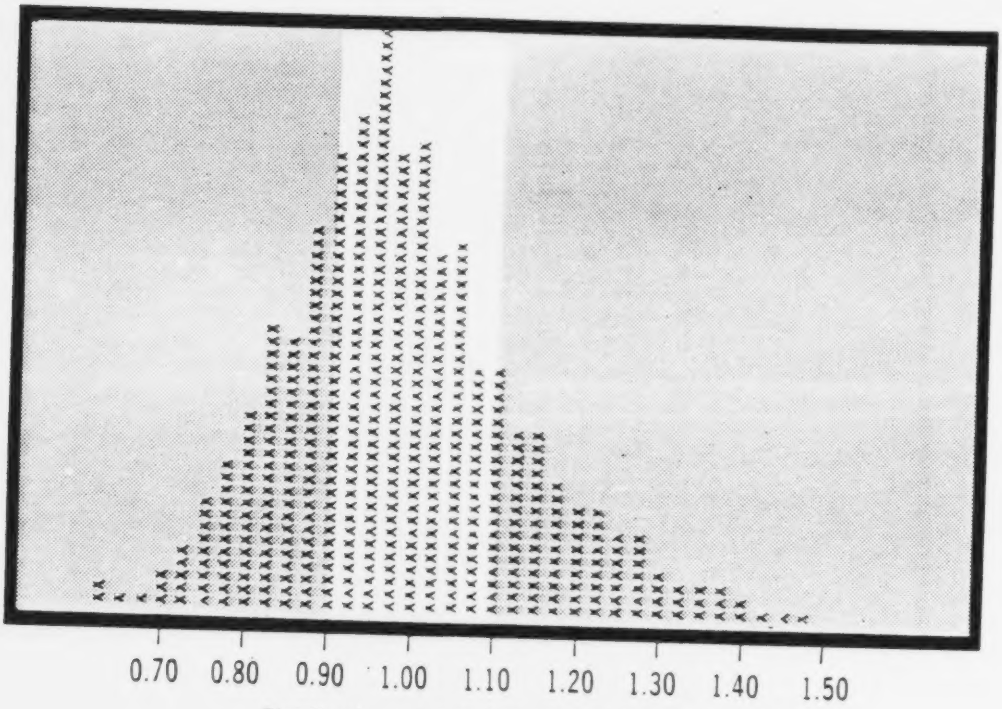


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Overall**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**10,347**

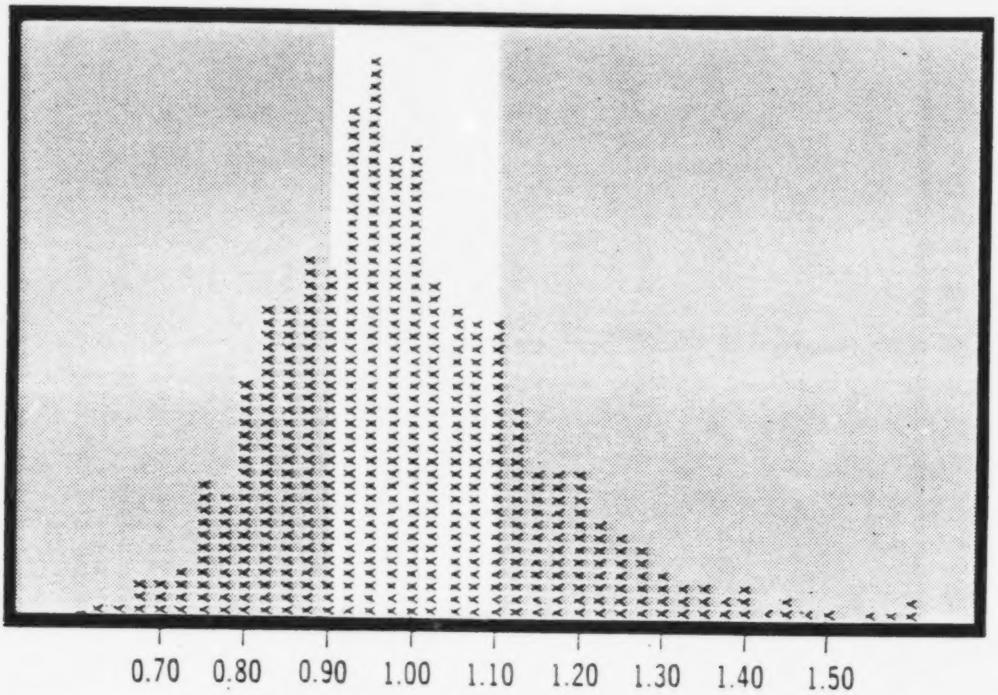
Adjustment: ....**Non-Modal Formula**

Algorithm: .... **Lo-OM (Eo)**



Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Overall**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**10,347**
Adjustment:	....	**Non-Modal Factor**
Algorithm:	....	**Lo = 0.86×Eo**

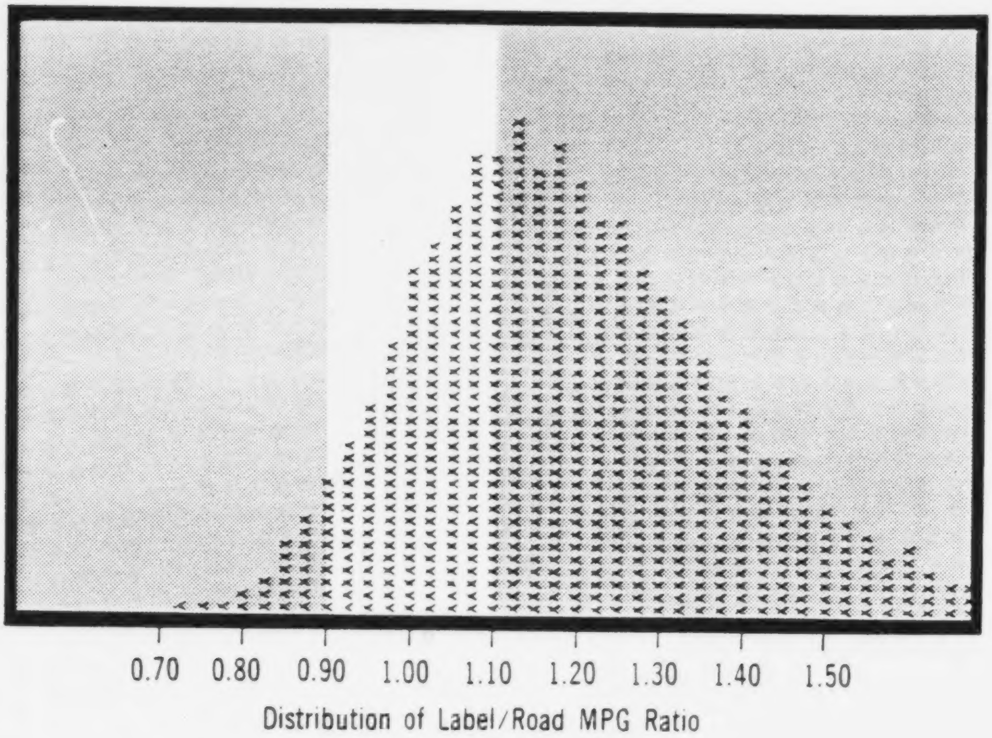


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Overall**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**10,347**

Adjustment: .... **City Number**

Algorithm: .... **Lo - Ec**



Test Fleet: Driving .... **Overall**

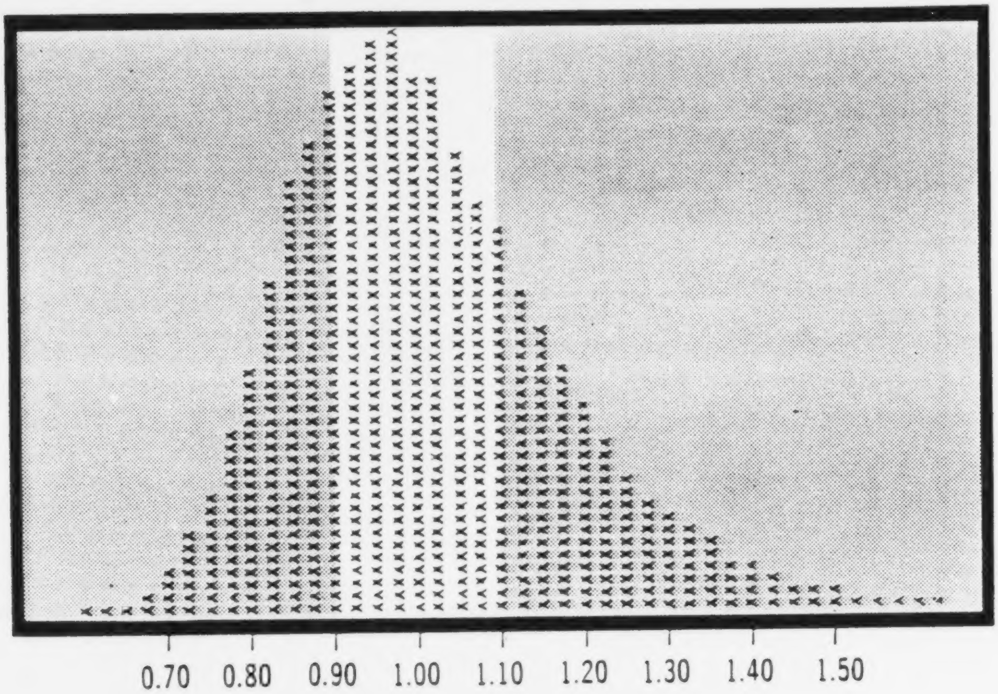
Tech/Ncyl Mix .... **As-Is**

Data .... **Diffuse**

Vehicles **41,906**

Adjustment: .... **Current System**

Algorithm: .... **Lo -Eo**



Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Overall**

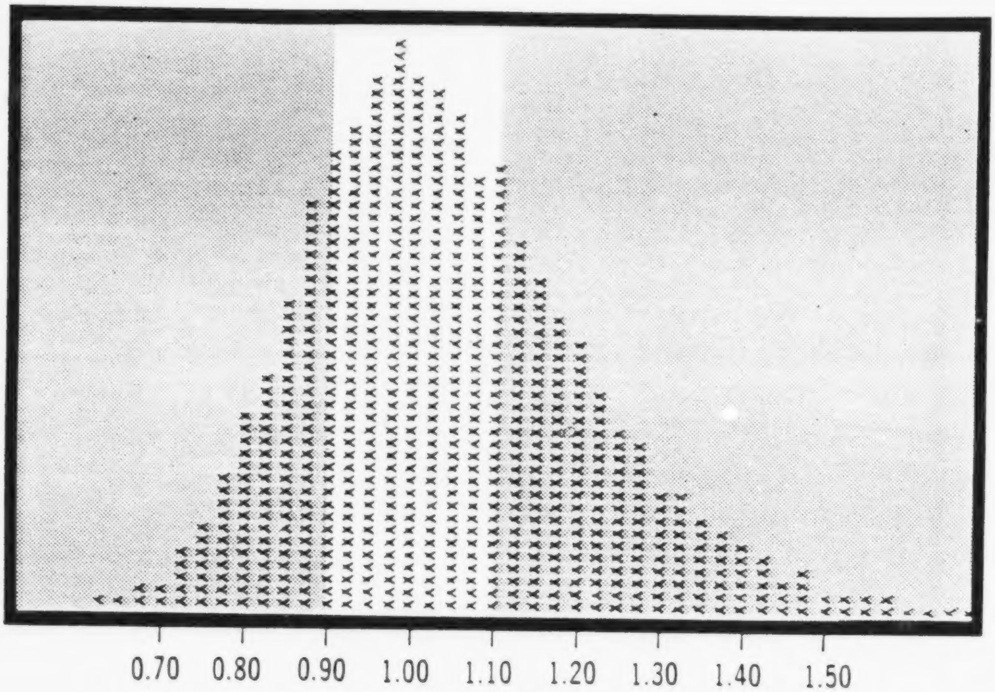
Tech/Ncyl Mix .... **As-Is**

Data .... **Diffuse**

Vehicles **41,906**

Adjustment: ....**Non-Modal Formula**

Algorithm: .... **Lo = OM(Eo)**

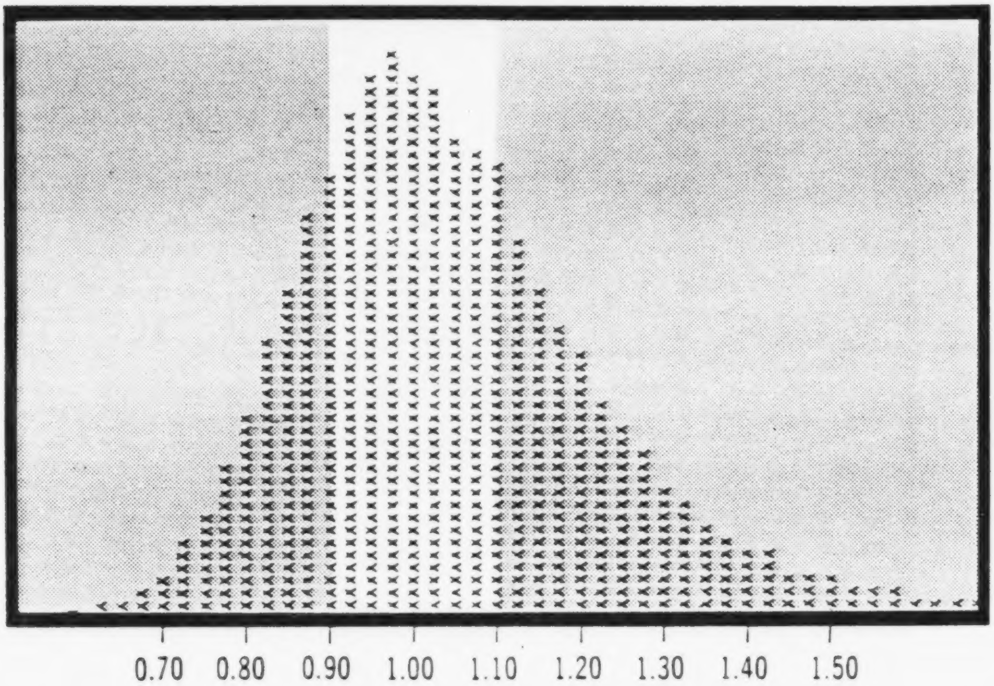


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Overall**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**41,906**

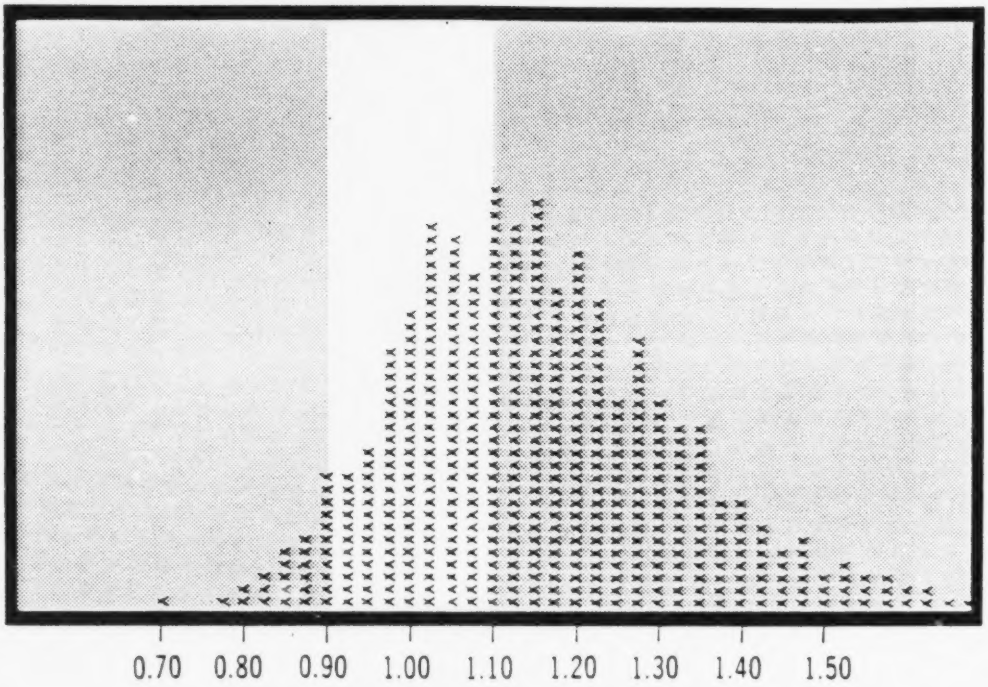
Adjustment: .... **Non-Modal Factor**

Algorithm: .... **Lo−0.86×Eo**



Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Overall**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**41,906**
Adjustment:	....	**City Number**
Algorithm:	....	**Lo-Ec**



Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **City**

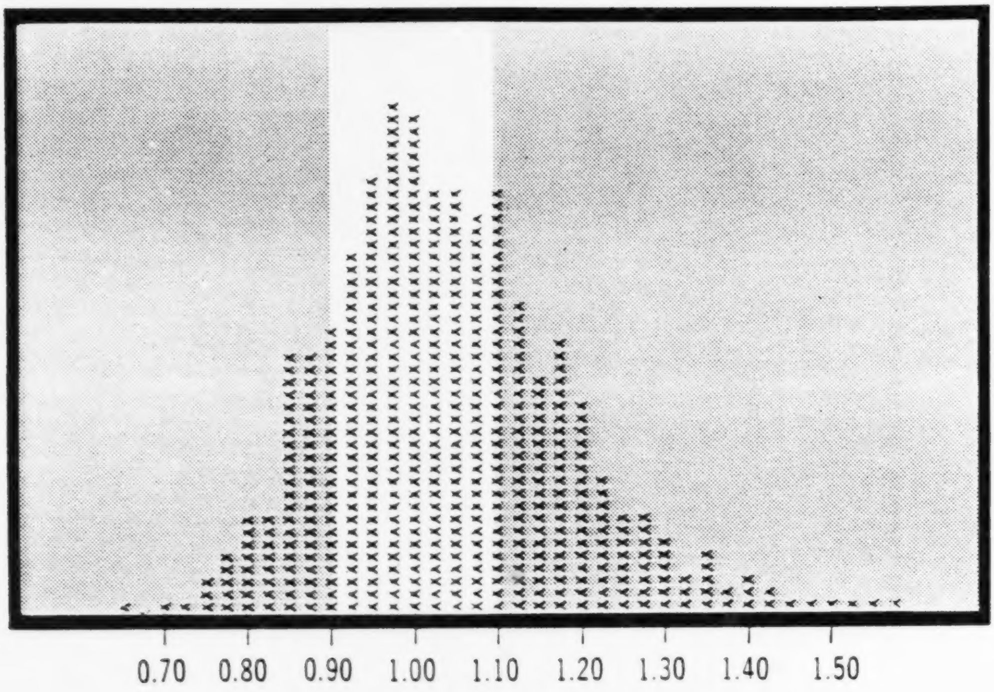
Tech/Ncyl Mix **1985**

Data .... **Diffuse**

Vehicles **5,084**

Adjustment: .... **Current System**

Algorithm: .... **Lc-Ec**

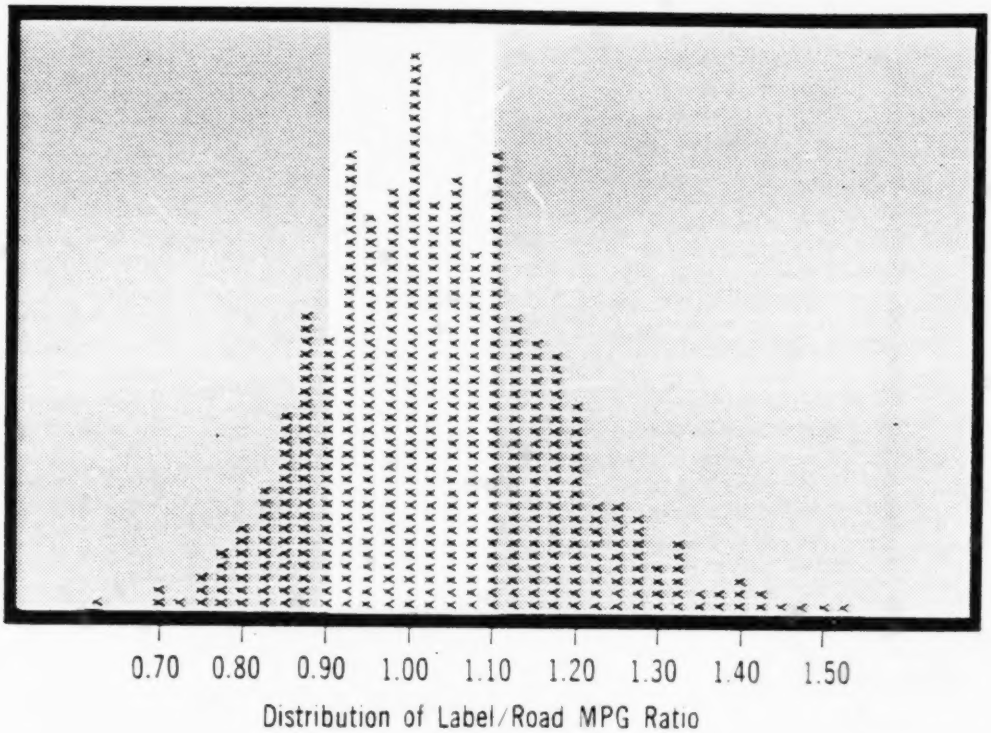


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,084**

Adjustment: .... **Non-Modal Formula**

Algorithm: .... **Lc = OM(Ec)**



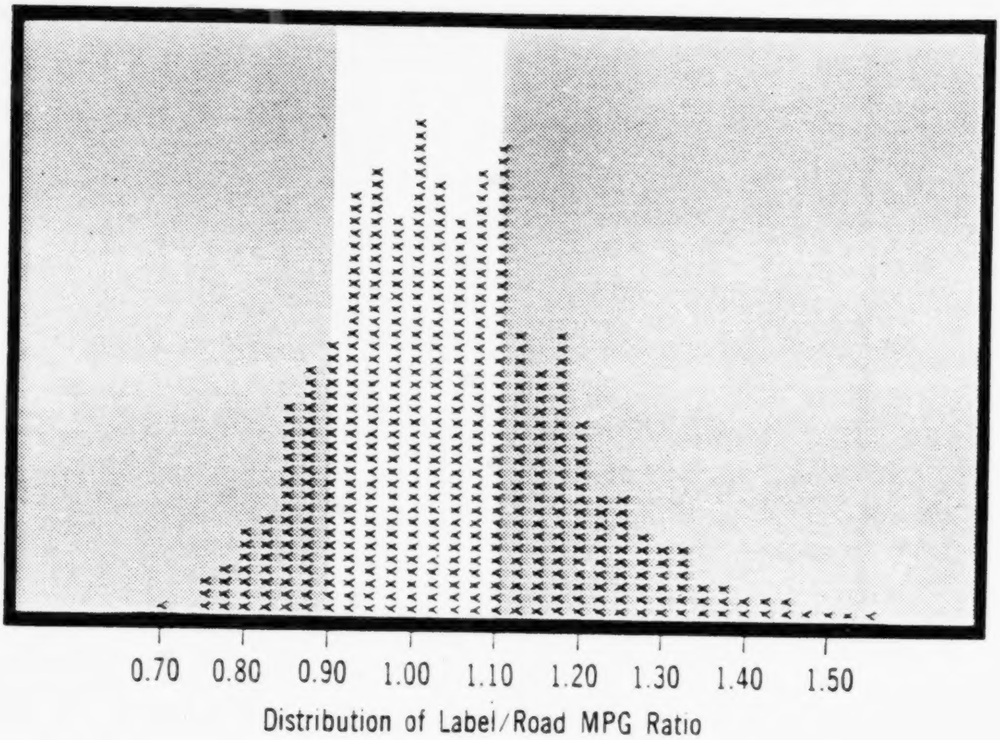
Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,084**

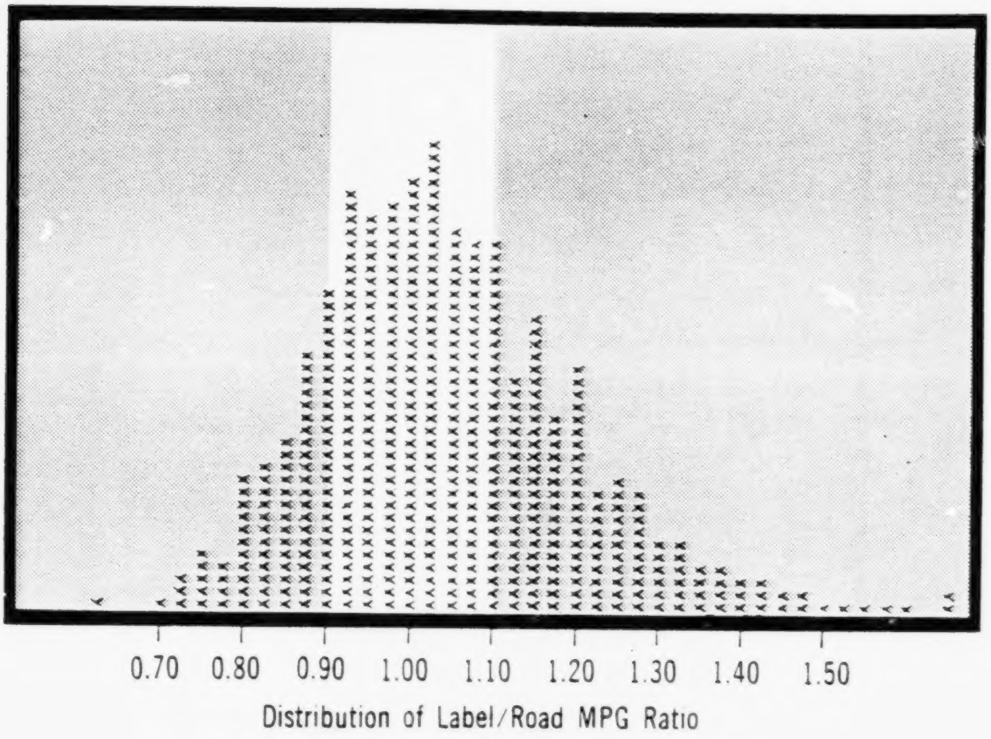
Adjustment: .... **City Formula 1**

Algorithm: .... **Lc = CM1 (Ec)**

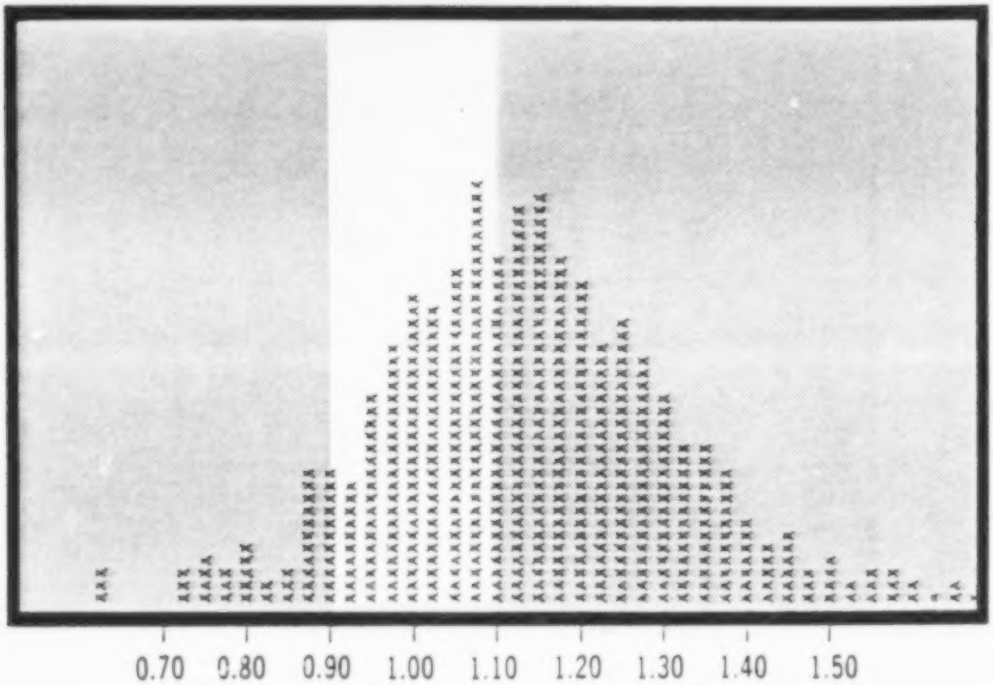
F16



Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,084**
Adjustment:		**City Formula 2**
Algorithm:		**Lc-CM2(Ec)**

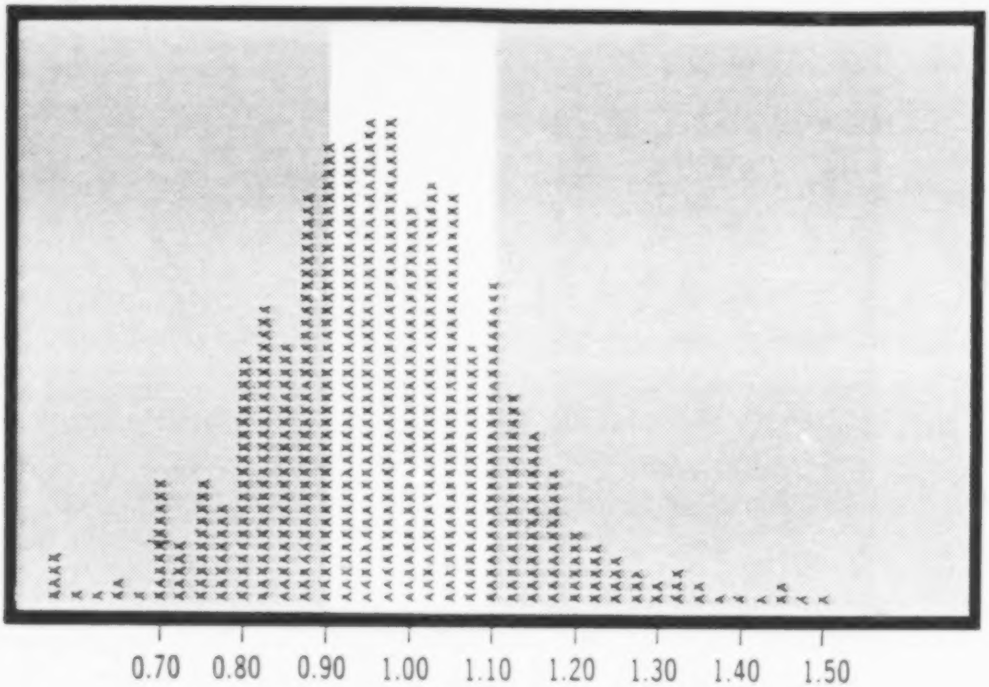


Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,084**
Adjustment:		**Factored City**
Algorithm:		**Lc = 0.90 × Ec**



Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Highway**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,139**
Adjustment:		**Current System**
Algorithm:		**Lh-EH**



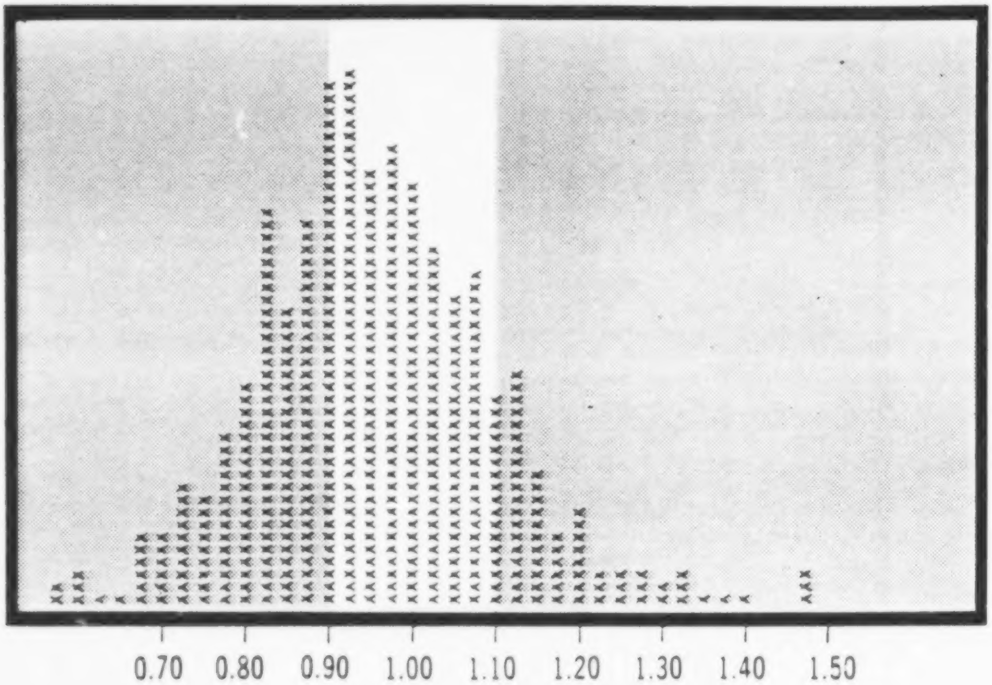
Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Highway**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,139**

Adjustment: .... **Non-Modal Formula**

Algorithm: .... **L_H - OM(E_H)**

F-20

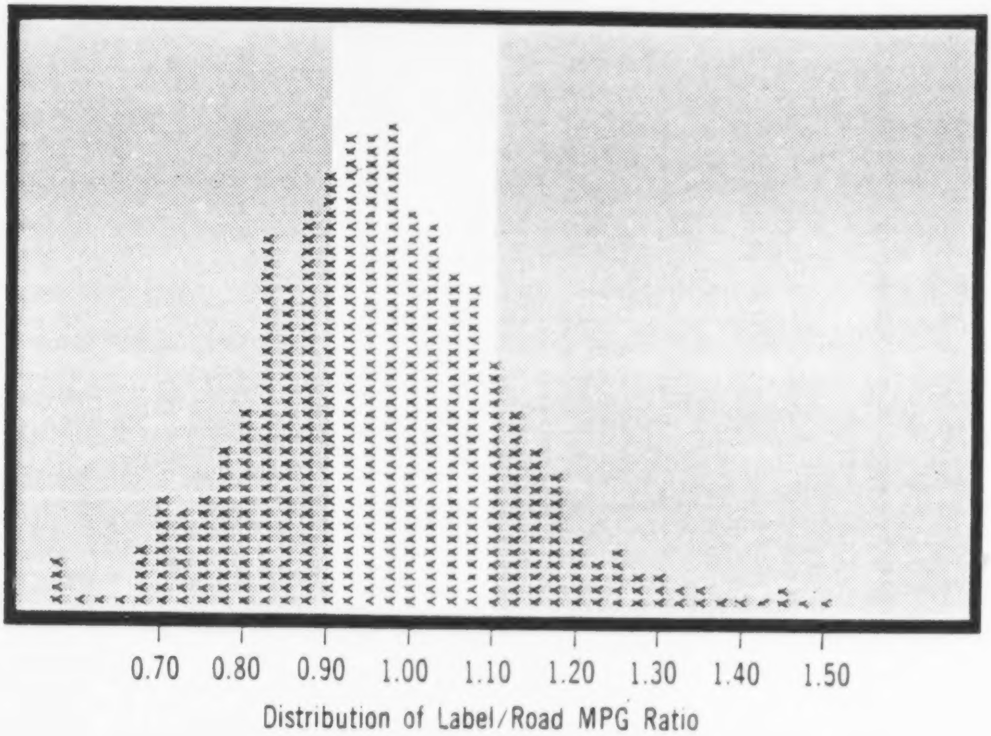


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Highway**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,139**

Adjustment: .... **Highway Formula 1**

Algorithm: .... **L_H-HM1 (E_H)**



Test Fleet: Driving .... **Highway**

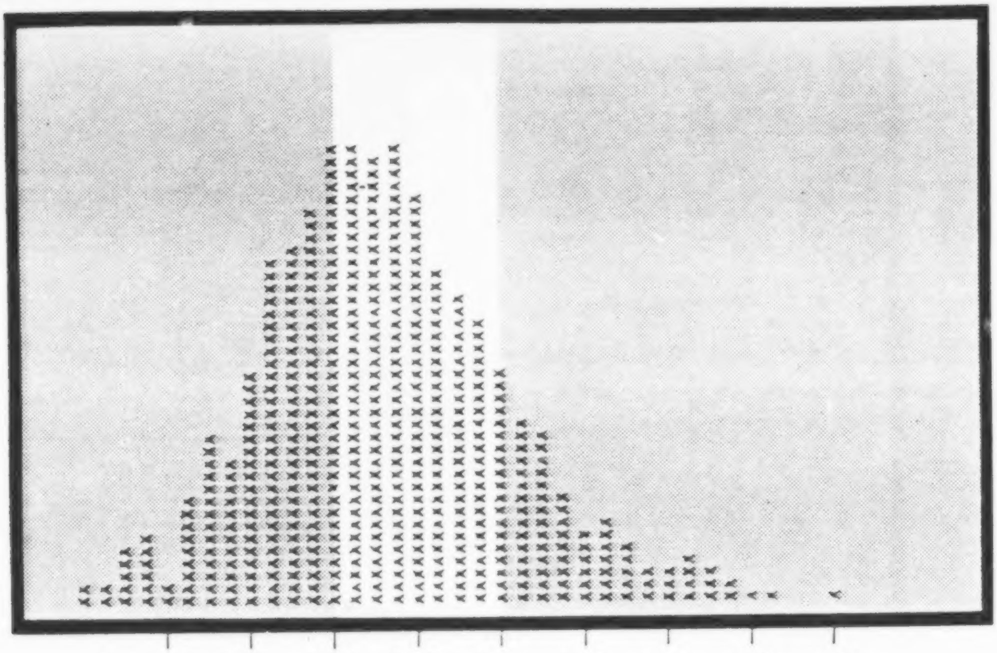
Tech/Ncyl Mix **1985**

Data .... **Diffuse**

Vehicles **5,139**

Adjustment: .... **Highway Formula 2**

Algorithm: .... **L_H-HM2 (E_H)**

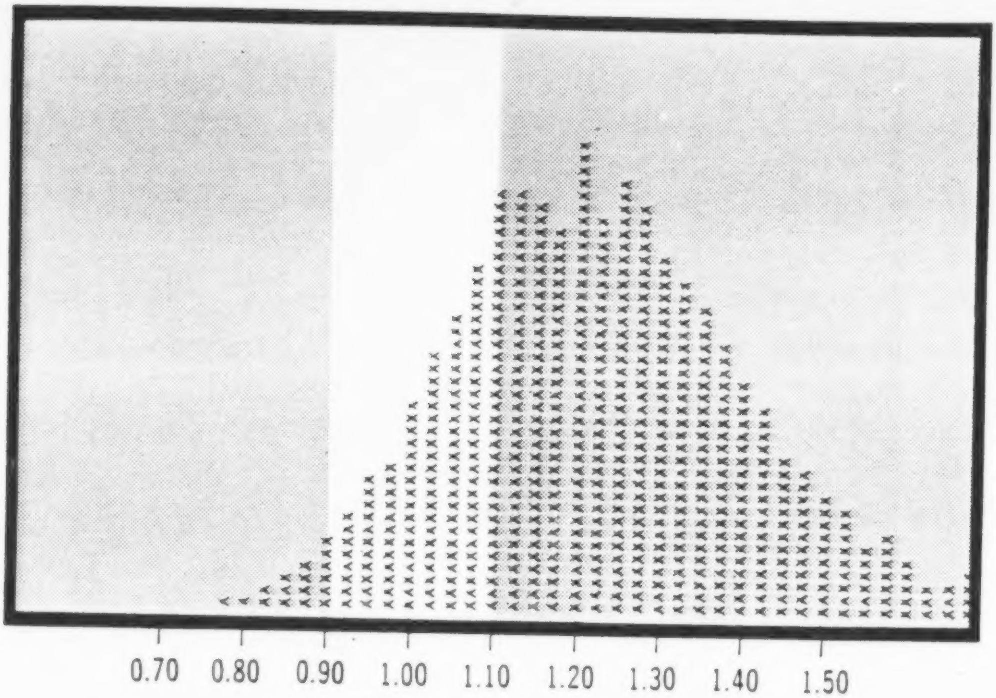


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Highway**
	Tech/Ncyl Mix	**1985**
	Data	**Diffuse**
	Vehicles	**5,139**

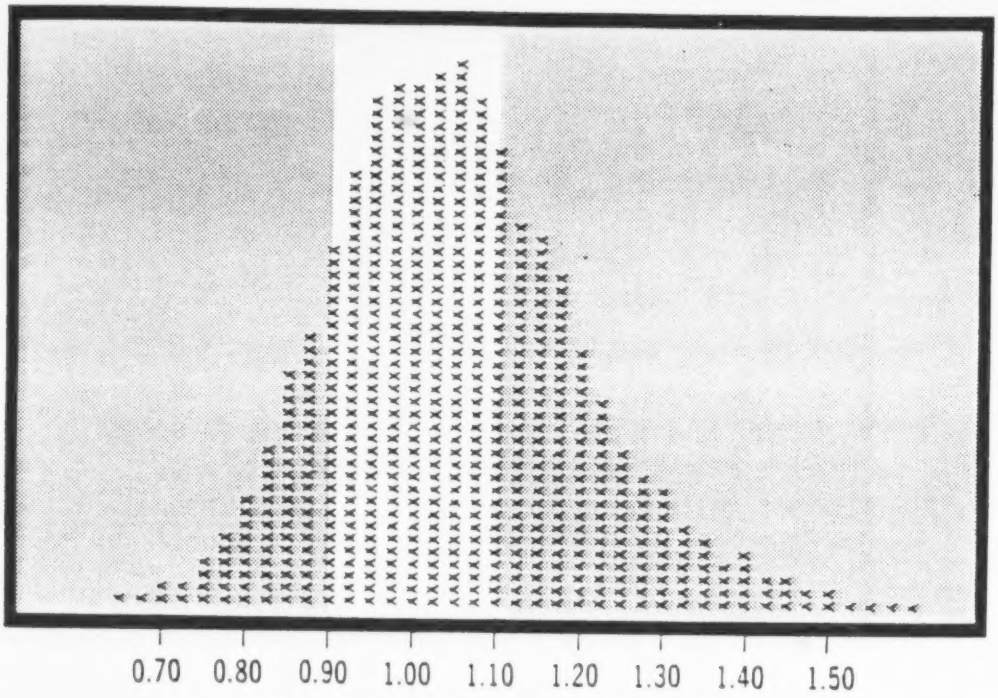
Adjustment: .... **Factored Highway**

Algorithm: .... **L_H=0.84E_H**



Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**12,664**
Adjustment:		**Current System**
Algorithm:		**Lc=Ec**

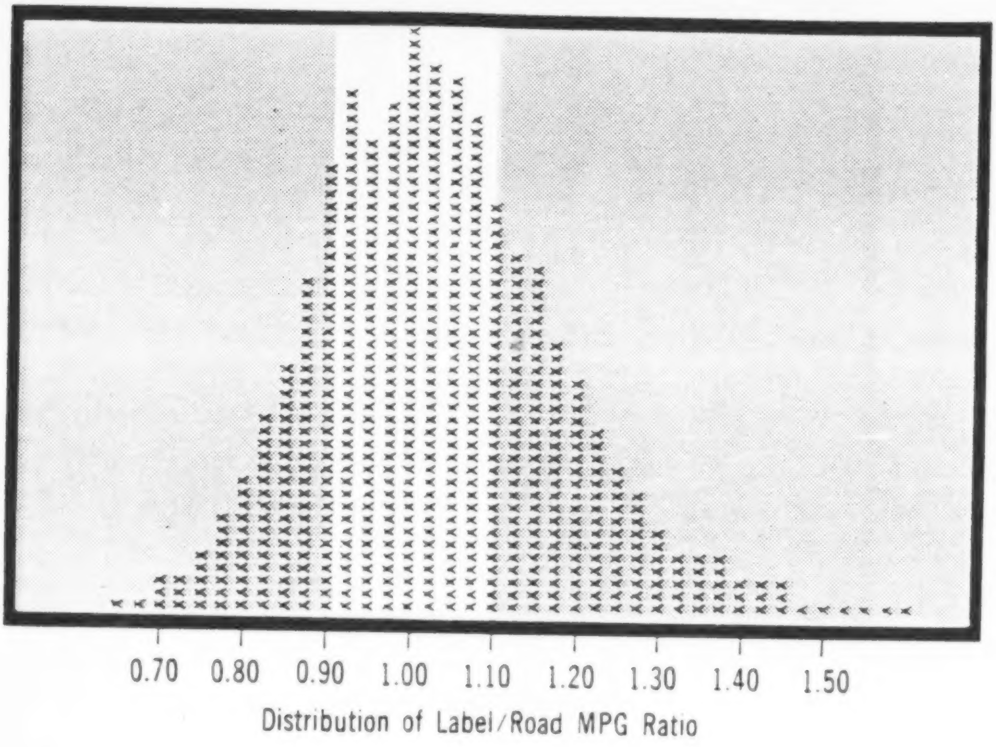


Distribution of Label/Road MPG Ratio

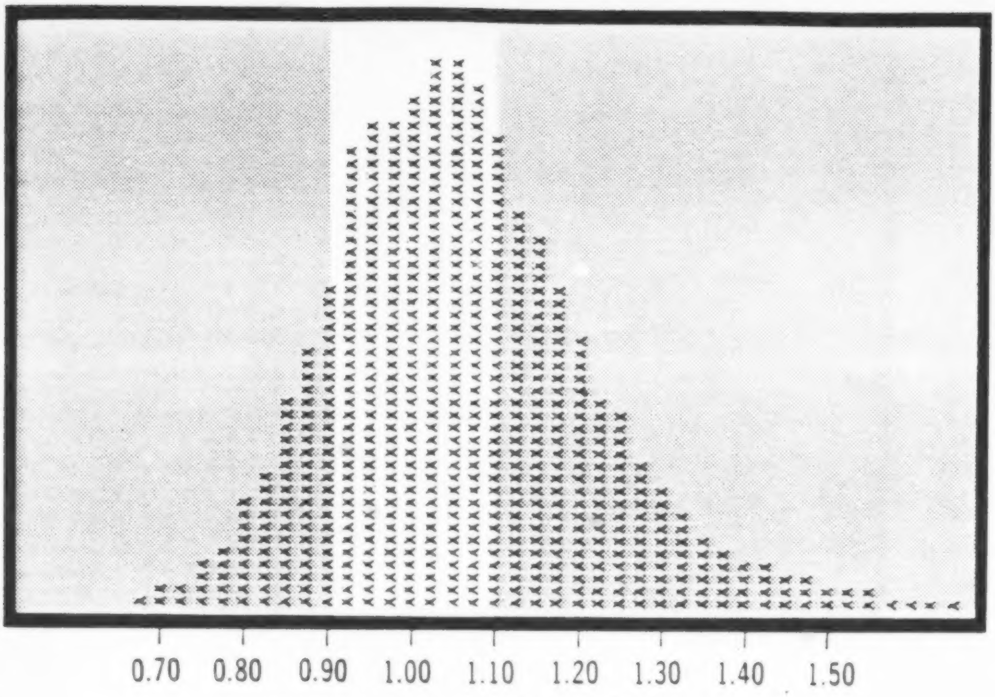
Test Fleet: Driving .... **City**
Tech/Ncyl Mix .... **As-Is**
Data .... **Diffuse**
Vehicles **12,664**

Adjustment: ....**Non-Modal Formula**

Algorithm: .... **Lc=OM (Ec)**



Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**12,664**
Adjustment:		**City Formula 1**
Algorithm:		**Lc-CM1(Ec)**

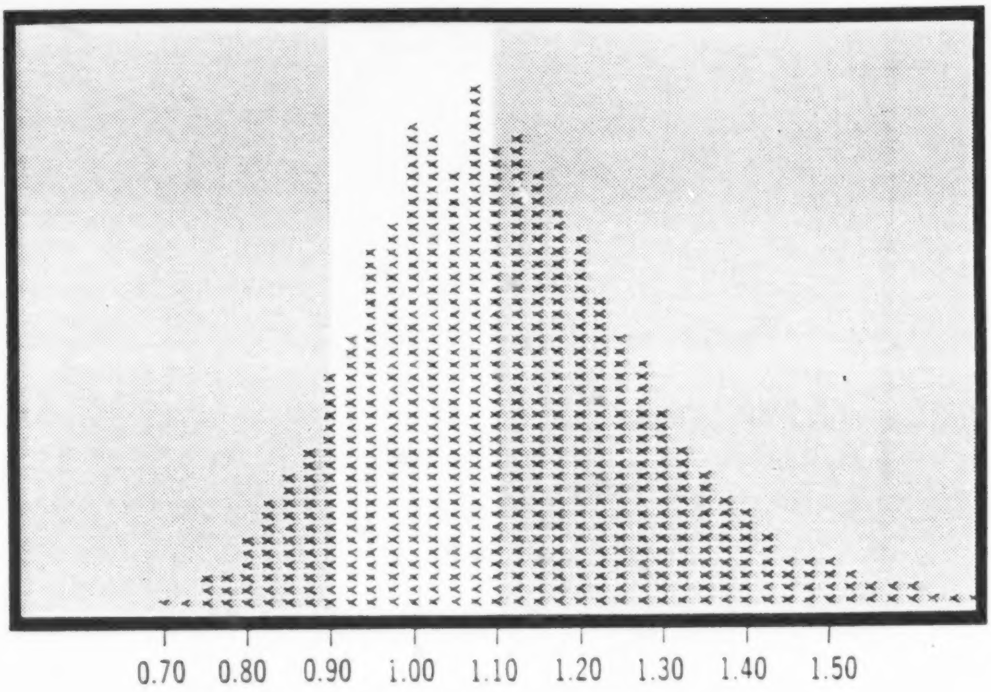


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**12,664**

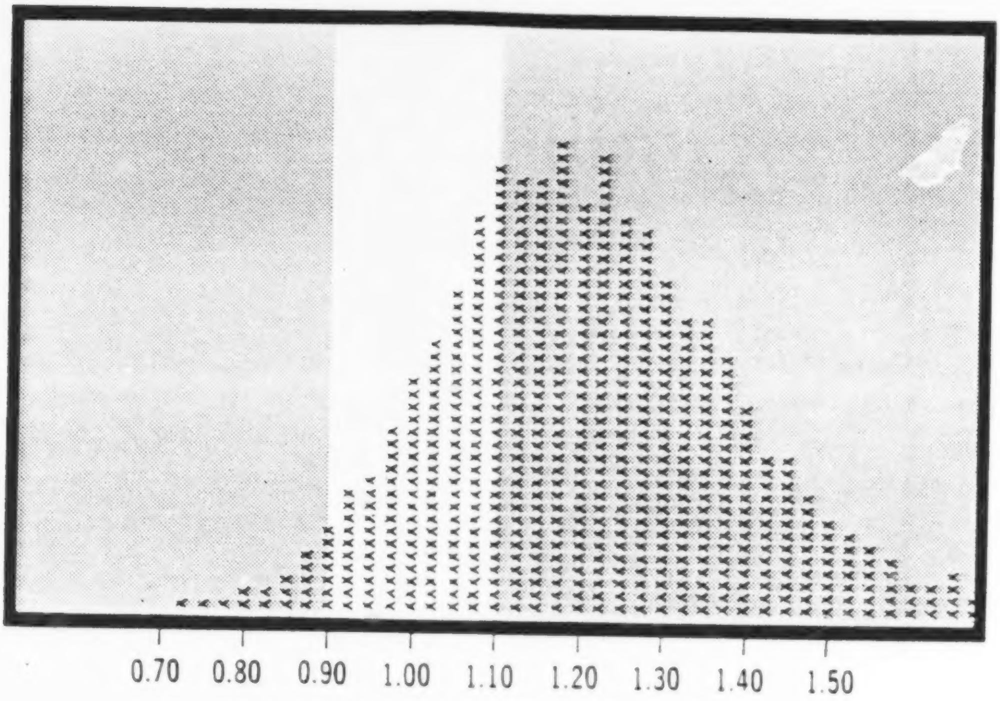
Adjustment: .... **City Formula 2**

Algorithm: .... **Lc−CM2 (Ec)**



Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**City**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**12,664**
Adjustment:		**Factored City**
Algorithm:		**Lc = 0.90 × Ec**

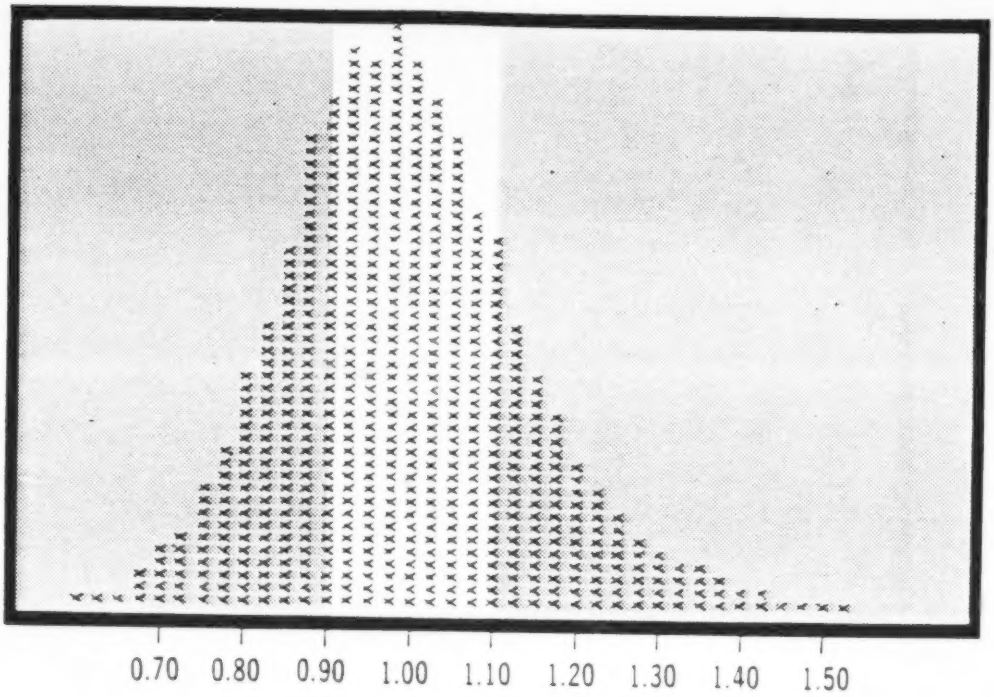


Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Highway**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**12,666**

Adjustment: .... **Current System**

Algorithm: .... **LH-EH**



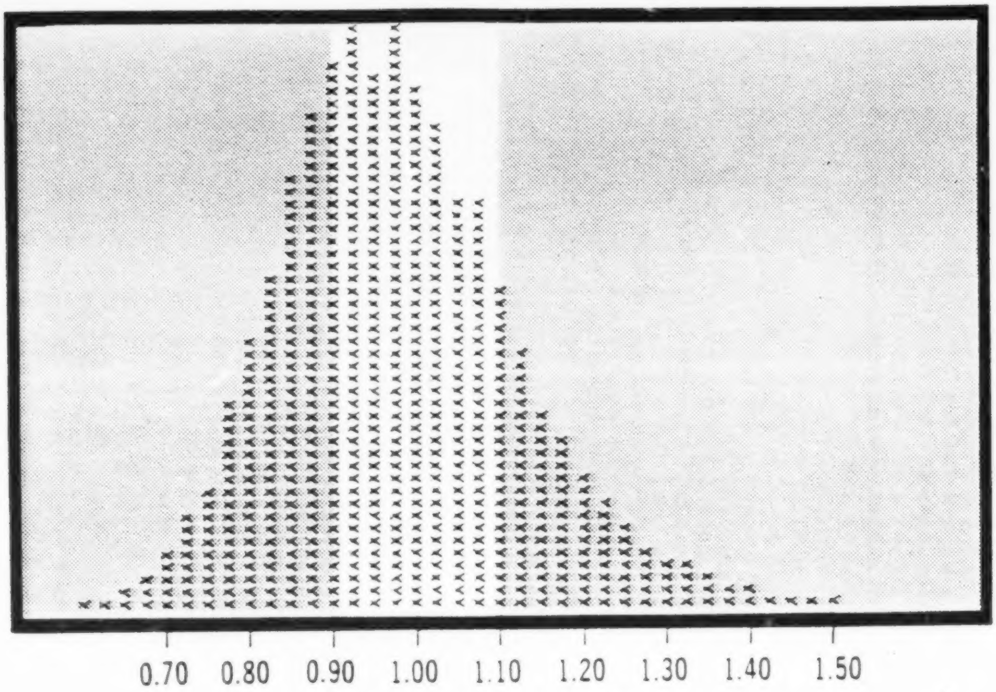
Distribution of Label/Road MPG Ratio

Test Fleet:	Driving	**Highway**
	Tech/Ncyl Mix	**As-Is**
	Data	**Diffuse**
	Vehicles	**12,666**

Adjustment: .... **Non-Modal Formula**

Algorithm: .... **L$_H$-OM(E$_H$)**

F-30

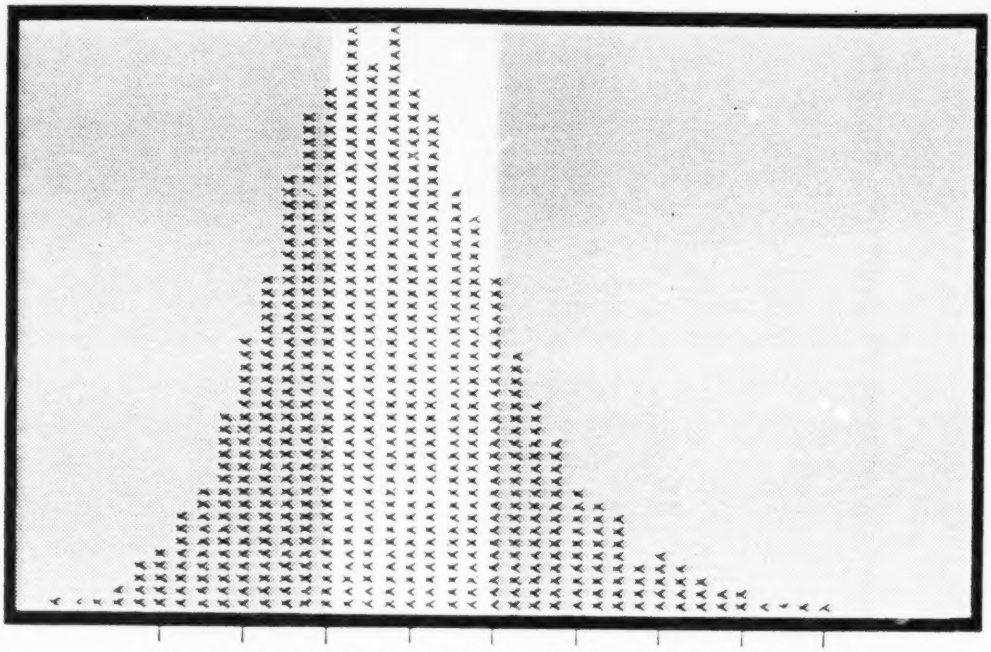


Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Highway**
Tech/Ncyl Mix .... **As-Is**
Data .... **Diffuse**
Vehicles **12,666**

Adjustment: .... **Highway Formula 1**

Algorithm: .... **LH-HM1(EH)**

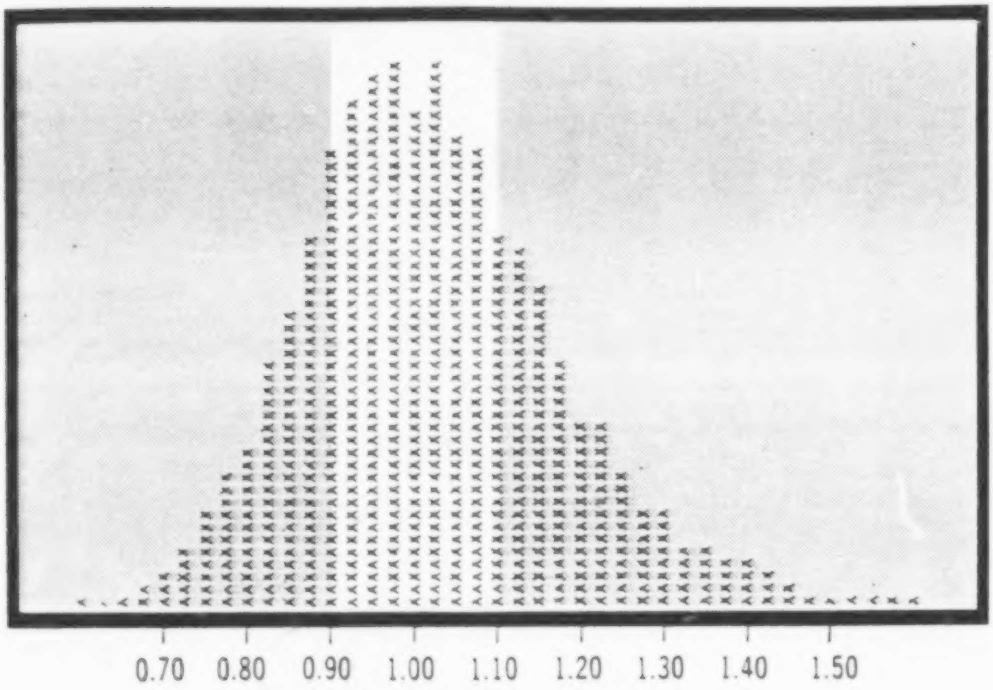


Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Highway**
Tech/Ncyl Mix .... **As-is**
Data .... **Diffuse**
Vehicles **12,666**

Adjustment: ....**Highway Formula 2**

Algorithm: .... **L_H=HM2 (E_H)**



Distribution of Label/Road MPG Ratio

Test Fleet: Driving .... **Highway**
Tech/Ncyl Mix ..... **As-Is**
Data .... **Diffuse**
Vehicles **12,666**

Adjustment: .... **Factored Highway**

Algorithm: .... $L_H = 0.84 \times E_H$